U. S. DEPARTMENT OF AGRICULTURE

OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

9 JUN 1929

VOLUME 57

JULY–DECEMBER, 1927

26 MAY 1938

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1928

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EXPERIMENT STATION RECORD

Vol. 57 July, 1927 No. 1

The advancement of research in rural economics and sociology is a matter to which much attention has been given. The need of more and better research in these fields has been generally conceded, and the number of trained workers has been steadily enlarging to meet the demand. Since the passage of the Purnell Act, funds have been available to an increasing degree in practically all of the experiment stations. Hundreds of projects have been outlined, interest has been keen, and the opportunities for constructive contributions have been unusually attractive. Encouraging progress has been made, and not the least important result of this progress has been the revealing more concretely of some of the outstanding obstacles in the way.

The difficulties which have thus far been encountered are mainly attributable to the newness of the field. Experience is still meager, and it may well be that the best means of approach are yet to be discovered. To be sure the fundamental principles underlying the carrying on of research in the physical sciences are well established, but there is uncertainty as to the extent to which they may be applied to the current problems of economics and sociology. Particularly is there doubt and confusion as to the manner in which the current research methods may best be utilized in the solution of this type of problems.

Much of this groping for the light is inevitable under the circumstances, and in not a few instances time and patience will probably be needed to overcome by actual experience the handicaps of false starts and blind trails. This is a common occurrence in all research and need occasion neither great surprise nor undue alarm. What is really most encouraging about the matter is the active interest which is being manifested by the research workers themselves in developing effective methods and adequate ideals, and their efforts thus to raise the standard of their research have a special interest and appeal.

One of the early steps taken by the agricultural economists and rural sociologists was the devotion of the meeting in December, 1925, of the American Farm Economic Association to the general topic of

research in agricultural economics, and the practically simultaneous sessions of the rural sociological section of the American Sociological Society, which dealt exclusively with research in rural social problems. Both of these gatherings, which were commented upon at the time in these columns, proved productive of much benefit, particularly in stimulating interest and in promoting an interchange of view on methods and objectives.

In the month following, an advisory committee on research in agricultural economics was appointed by the chairman of the Social Science Research Council. This committee was headed by Dr. H. C. Taylor of the Institute for Research in Land Economics of Northwestern University, and it was instructed to make "a preliminary survey of the problems in the field of agricultural economics." This committee has carried on a survey of the work under way under various auspices, and it has recently presented a report embodying extensive findings and recommendations. Funds have also been secured for a more detailed survey, and arrangements made for its prosecution on a regional basis by five representative men in agricultural economics and a sixth to take up rural sociology, with a view to rendering a preliminary report at a meeting of the council to be held at Dartmouth College from August 16 to 21, 1927. In this work the committee has the cooperation of a special research committee of the American Farm Economic Association.

The report of the original committee, noted elsewhere in this issue, estimates that for the present year approximately $1,500,000 will be spent by Governmental agencies, State and national, for investigational work in agricultural economics and rural sociology. "During the next four years the increase made possible under the Purnell Act will enlarge this total by something like another million dollars. Private agencies provide further resources which we estimate at more than $100,000 yearly."

On a qualitative basis, the committee finds that the work being done is "very uneven in character. This may be explained quite largely by historic reasons. In places where the work was begun early, the descriptive and elementary stages have been passed through and enough time has elapsed to develop better methods and to build up more specialized and more adequately trained personnel. The newer comers in the field and the smaller institutions have tended to lag behind, frequently to use less fully trained men, and not to find themselves in a position to employ staffs large enough to permit a desirable degree of specialization. It must be frankly admitted also that a serious difficulty in this connection has arisen from the fact that the direction of attention and the flow of funds into these lines of work have proceeded so rapidly as to outrun the supply of com-

petent men who could be selected and trained in a manner corresponding to the needs of the work. This defect has been remedied in part, but has probably resulted in the building up of relatively large and specialized staffs at a few places rather than bringing the standard of work done in any given line at all institutions up to a satisfactory level."

The committee concludes that "probably enough work has now been done in most of the major lines of agricultural economics research to have built up a methodology and standards of investigation and analysis which have established at least tentative standards which could be very advantageously adopted throughout the field. Until such a standardization takes place, a large amount of imitative, unproductive, and even misleading work is bound to be done at places where a more effective use of labor and funds is much to be desired."

A third comment on the present status of the work is that it is rather fragmentary in character. "This applies both to the discreteness of local studies on problems of national or at least regional scope and interest, and also to the fact that work has been prosecuted on various segments of a problem separately. Too little effort has been made to integrate all the steps and develop a comprehensive and coherent analysis of problems as a whole from producer to consumer, local market to world market, or whatnot."

By way of summary the committee believes that the principal problem in agricultural economics is "not so much the stimulation of activities or expansion of progress as it is (1) the promotion of a more effective expenditure of funds already available, (2) the correlation of the various efforts, and (3) raising standards of work throughout the field."

The committee makes numerous specific recommendations, including the establishment of a fund for use in paying field and clerical expenses of graduate students, restricting the grants to projects not generally supported by station funds, and an additional amount for publishing not to exceed three of the best doctoral dissertations in agricultural economics and rural sociology each year. It also suggests as projects worthy of investigation the measurement of agricultural prosperity and rural living, research on agricultural depressions, country-city and city-country population movements, submarginal land and submarginal farms, and the improvement of the Federal census. Its chief recommendation, however, is for the creation of a permanent standing committee, with a budget of $12,000 per year. This committee would serve as a clearing house of information as to research now under way or in contemplation by the various agencies, as a conference body on standards and methods, and as a

means of contact between agricultural economists and rural sociologists and the various allied groups represented in the council.

Since the presentation of the foregoing report, another and entirely independent enterprise has been undertaken by the rural sociologists which is both unique and suggestive. This has taken the form of an Institute on Research Methods in Rural Sociology, which was held at Purdue University from April 4 to 8, 1927.

The institute was held at the request of a joint committee on projects and correlation of the Association of Land-Grant Colleges and was authorized by the executive committee of that association. It was conducted by the committee on rural social organizations and agencies essential to a permanent and effective agriculture, largely composed of sociologists but with Director G. I. Christie of the Indiana Station as chairman.

Although the institute was essentially a conference of workers engaged in projects on rural sociology, its purpose was not primarily for discussion and exchange of views. Its object was to offer a definite program designed to develop the best ideas available as to the organization and conduct of research in this field, with specific reference to the work already under way or in contemplation.

The occasion for so unusual a gathering was the prevailing feeling among rural sociologists that at the present stage such an undertaking would be productive of economy of effort and of funds. As was stated in a letter sent out by the Office of Experiment Stations indorsing the institute, "as is often the case in subjects in which research is relatively new and undeveloped, rural sociology as a field for investigation appears to be less organized and the ways and means less clearly established than in fields where research has long been active. As a result rural sociologists feel that they have experienced somewhat unusual difficulties in harmonizing their efforts with present-day standards and concepts of research, as represented in some of the older branches. They express themselves as being confronted with questions regarding the proper approach to the large, complex problems presented in their field, embracing situations and conditions not easily analyzed for effective study. They also encounter questions regarding the methods and procedure best adapted to qualitative and quantitative studies, and the breadth of interpretation which may be given to individual findings."

The institute was frankly an experiment, and accordingly the extent of its appeal was a matter of unusual interest. Taken as a whole the attendance was very encouraging. From 21 experiment stations there were registered a total of 33 workers, drawn from a territory extending from Connecticut to California and from Mon-

tana to South Carolina and embracing nearly all of the active Purnell projects in rural sociology. From the U. S. Department of Agriculture, the Bureau of Agricultural Economics and the Office of Experiment Stations sent three members of their staffs. The Institute of Social and Religious Research, Western Reserve University, University of Chicago, and other colleges, theological seminaries, institutions, and agencies were also represented.

An important part of the program centered around the presentation and discussion of the current station projects. Each of these projects was taken up in turn to show the nature of the problem, the methods being followed, the difficulties encountered, and the results thus far obtained. This critical analysis was followed by a discussion and reference to a special committee. Four of these committees were organized, each with a personnel embracing all members with projects along that line. A report was made by each committee to the general meeting, discussed in detail, referred back to the committee for the incorporation of such suggestions as had been agreed upon, resubmitted to the general body, and after further discussion adopted. In this way the individual projects received minute critical scrutiny, and oportunity was also presented for consideration of broad general principles and the most effective methods and procedure.

Another feature of the institute was the more formal presentation of topics dealing with subject matter and research methods. In all seven addresses were presented, mainly by men of recognized authority in sociological research. These addresses covered such topics as the use and limitation of a statistical method in rural social research, scientific methods in urban research, a comparison and relation of economic and social research, research on the American village, the fundamentals of scientific research in rural sociology, a historical analysis of methodology in rural social research, and the relation of research in rural sociology to agricultural extension work.

Opportunity was also afforded for general discussion of the problems confronting rural sociology workers. Among the topics which were taken up in this way were the training of research workers, the publication of findings, the need for more detailed data to be gathered by the U. S. Census bearing on farm population and farm statistics, and future plans to further the effectiveness of rural social research.

One of the specific undertakings of the institute was the consideration and restatement by special committees of the projects which had been tentatively outlined for inclusion in a national research program in rural sociology. As a result a number of recommendations were made along each of the four lines.

As regards rural standards of living, the measure of relative success or failure of agriculture, it was brought out that the major factors affecting or related to farm family living include not only the traditional items of food, clothing, and housing, but also community relations, institutions, customs, use of time, conditions of home surroundings, and other social conditions. For this reason the inquiry was considered primarily one for sociology, although one in which cooperation may well be maintained with health specialists, educators, religious leaders, farm economists, and home economists. The studies already made were deemed to justify a still more detailed inquiry into some broader aspects of family living than bare costs, so that the standard of living may be measured in more adequate terms than dollars. A detailed plan of procedure from this point of view was outlined, and it was recommended that contiguous States in various commodity regions should cooperate in these studies and that States containing racial groups or outstanding high tenancy areas should confer and cooperate in such areas.

The existing projects on rural population studies were recommended for continuance in close relationship to the studies on standards of living, rural groupings, and changes in rural life. Data on such phases as composition of the State rural population, increases and decreases, and the trend to and from the country, other changes and their characteristics, and vital statistics were regarded as deserving of collection and analysis. The caution was deemed necessary that such demographic material "be not studied for its own sake but to contribute to an understanding of the problems of community life. Studies of population, as such, are not ends themselves, but are means to an understanding of rural life."

For the projects termed the sociology of rural groups and young people's organizations as a factor in rural life, certain fundamentals were suggested, both as dealing with general conditions and as concrete groups in specific localities. For young people's organizations it is suggested that the procedure "should include an analysis of office records of the organizations and the agencies conducting and supervising young people's work of various types. It should also include a field study of the activities of the various groups involved in such work as public service leaders, the young people themselves, parents, teachers, and other local volunteer leaders. This may also include a psychological study of the relationships between the organizations and the character and leadership of the young people."

A detailed report issued in mimeographed form by the committee in charge concludes with the statement that the institute "proved of immense value to those who attended by clearing up a number of such questions as the scope of the field, types of studies, statistical

methods, cooperation with research workers in other fields, and general procedure in planning projects." The view is expressed that the task before the group was too large to complete at one time, and it strongly advocates that a similar institute be held in 1928 to be devoted exclusively to the details of the technique of research. The holding of a second institute obviously raises some questions of policy less acutely presented by the initial conference, and will evidently require consideration from various points of view by the several agencies interested. Whatever may be the decision in this regard, however, the first institute was apparently very beneficial. The fact, already referred to, that it came about as the result of a movement sponsored by the research workers themselves is especially significant and encouraging. As an instance of self-examination it reveals an attitude of mind in thorough accord with the spirit of science. As a practical demonstration of willingness to cooperate for mutual improvement it embodies an ideal which, if consistently adhered to, should tend to promote a maximum of effective service in the field as a whole.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Production and utilization of fats, fatty oils, and waxes in the United States, G. S. JAMIESON (*U. S. Dept. Agr. Bul. 1475 (1927), pp. 36*).—This is a revision of Department Bulletin 769 (E. S. R., 40, p. 614), which it supersedes. Vegetable oils, animal oils and fats, fish and fish liver oils, and wax are considered, the general method of preparation and uses of all the more important being described. Three tables of production and consumption statistics are appended.

The deodorization of coconut oil, W. L. BROOKE (*Philippine Jour. Sci., 30 (1926), No. 2, pp. 201–212*).—In an analysis of the steam volatile, water insoluble substances driven off from coconut oil in the process of deodorizing by blowing superheated steam through it, methyl nonyl ketone was isolated and identified by means of its oxime, semicarbazone, and dioxime, the preparation and physical constants of which are described. The nonsaponifiable portion of the material removed by steam from the oil also yielded a white glycerin-like substance, apparently a higher alcohol, possessing an odor similar to that of octyl alcohol.

A systematic method for the detection of the principal anions [trans. title], L. FERNANDES and U. GATTI, trans. by H. P. FORAN (*Gaz. Chim. Ital., 53 (1923), No. 2, pp. 108–114; trans. in Canad. Chem. and Metall., 10 (1926), No. 11, pp. 259–261*).—This is a systematic qualitative method for the detection of the more important inorganic and organic acid radicals. These radicals are classified in six groups, the first five of which are precipitated by the following group reagents: (1) Magnesium nitrate+ammonium hydroxide, (2) calcium nitrate+ammonium nitrate, (3) barium nitrate, (4) mercuric nitrate, and (5) silver nitrate. The sixth group has no general precipitating agent.

A trier of the takedown pattern for sampling fertilizers [trans. title], E. ROUX (*Compt. Rend. Acad. Agr. France, 13 (1927), No. 12, pp. 371–373, fig. 1*).—The device consists of three sections which together form a trier 80 cm. (31.5 in.) in length. For shorter sacks the middle section may be omitted, forming a 60 cm. trier. The head of the upper section is bored transversely to receive a short iron rod, which may be inserted as a handle. Representative samples can be obtained from the mouths of the bags, avoiding the damaging of the bags and the consequent loss of contents caused by the repeated puncture of the fabric necessary when sampling with short triers.

Determination of mineral nitrogen in fertilizers, C. H. JONES (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 269–271*).—The present Official fertilizer methods were found to give inaccurate results for inorganic ammoniacal nitrogen and for nitrates in the presence of organic nitrogen. The following procedure was found satisfactory:

"Test the fertilizer qualitatively for nitrates. If present, proceed as follows: (1) Preparation of solution.—Place 4 gm. of the sample in a small beaker (150 cc.), add about 40 cc. of water, stir, filter by decantation, and after all the residue is transferred to the filter wash to just under bulk of 200 cc., let-

ting each washing run through before another is added. Make to bulk of 200 cc., mix, and treat 3 aliquots of 50 cc. each as directed under (2) and (3). Or place 4 gm. of the sample in a 200-cc. flask, add 160 cc. of water, shake thoroughly for 5 minutes, make to bulk of 200 cc., mix, and filter.

"(2) Ammoniacal nitrogen.—Place 50 cc. (equivalent to 1 gm.) of the solution prepared according to (1) in a 500–600 cc. Kjeldahl distillation flask, add 150 cc. of water and 5 gm. of magnesium oxide (heavy). Connect with an upright condenser, distill 100 cc. of the liquid into a measured quantity of standard acid, and titrate with standard alkali, using cochineal or methyl red indicator.

"(3) Nitrate nitrogen.—(a) Place 50 cc. of the sample prepared according to (1) in a 500–600 cc. Kjeldahl distillation flask, add 10 to 12 perforated glass beads (3 to 5 mm.), 2 gm. of reduced iron, and 10 cc. of dilute sulfuric acid (1:1). Rotate slowly and when any violence of reaction has moderated, place on hot plate and boil gently for 5 minutes. Remove, add 40 cc. of water, and cool. Add 100 cc. of strong sodium hydroxide solution. Connect at once with an upright condenser by means of a Kjeldahl connecting bulb, and boil until 150 to 160 cc. have distilled over and the distillate as it drops from the condenser shows neutral to litmus paper. Collect the ammonia in a measured quantity of standard acid and titrate with standard alkali, using cochineal or methyl red indicator. The nitrogen obtained represents that from nitrates, ammonia salts, and other nitrogenous compounds, proteins, cyanamide, urea, etc., that have been changed, wholly or partially, to ammonia by this treatment.

"(b) Correction blank.—Place 50 cc. of the sample prepared according to (1) in a 500–600 cc. Kjeldahl distillation flask and proceed exactly as under (a), except that no reduced iron is added. The nitrogen obtained represents that from ammonia salts and other nitrogenous compounds—proteins, cyanamide, urea, etc.—that have been changed, wholly or partially, to ammonia by this treatment. The percentage of nitrogen obtained by procedure (a) minus that obtained by procedure (b) equals the percentage of nitrogen from nitrates contained in the sample. Caution.—When cyanamide is present in amounts greater than 150 lbs. per ton or the distillate under (3 a) or (b) fails to show neutral when finally tested with litmus paper, repeat procedures (a) and (b), using a 25-cc. aliquot (0.5 gm.) and add 25 cc. of water previous to the addition of the 10 cc. of sulfuric acid (1:1). Run procedures (a) and (b) synchronously and see that both aliquots are taken from the same solution."

By the proposed method 0.39 per cent of nitrate nitrogen was found as against 0.25 per cent present in the sample showing the largest discrepancy, the Official method giving 0.98 per cent nitrate nitrogen for the same sample. In a comparative test with 12 samples of known nitrate content, the proposed method gave results in close agreement with the known nitrate nitrogen content of the test samples, while the results with the Official method gave decidedly high results with but three exceptions.

Detection and determination of nitrogen-bearing chemicals added to animal or vegetable nitrogenous materials, H. C. Moore and R. White (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 264–266*).—A mechanical separation of cyanamide and ammonium sulfate added to tankage may be obtained by flotation in carbon tetrachloride. The tankage floats, but cyanamide and ammonium salts settle out. The usual qualitative tests for nitrates, cyanamide, ammonium sulfate, and urea may be applied. If the carbon tetrachloride be diluted with nearly an equal volume of turpentine, urea crystals will be floated or suspended. The quantitative determination is made as follows:

For solution 1, transfer 5 gm. of the ground tankage to a beaker, add about 100 cc. of alcohol, and allow to stand half an hour, stirring frequently. Trans-

fer from the beaker to a filter and wash with alcohol, finally making the volume to 250 cc. For solution 2, wash the residue on the paper from solution 1 into a 250-cc. volumetric flask with about 150 cc. of water, shake frequently for from 15 to 30 minutes, finally making to volume, and pass through a dry filter. For solution 3, transfer 5 gm. of the sample into a 250-cc. volumetric flask, add about 200 cc. of water, stopper, and shake frequently for one hour. Make to volume and pass through a dry filter.

To determine nitrogen in the form of nitrate, transfer two 50-cc. portions of solution 3 to separate Kjeldahl flasks. To aliquot A add 10 to 12 perforated glass beads (3 to 5 mm.), 2 gm. of reduced iron, and 10 cc. of dilute sulfuric acid (1:1). Rotate slowly and when any violence of reaction has moderated, place on hot plate and boil gently for 5 minutes. Remove, add 40 cc. of water, and cool. Add 100 cc. of 42° Bé. caustic soda solution, connect at once with an upright condenser by means of suitable connecting bulb, and boil until 150 to 160 cc. have distilled over and the distillate as it drops from the condenser tube is neutral to litmus paper. Collect the ammonia in standard acid, titrating the excess with standard alkali and determine the ammonia thus collected. To aliquot B are likewise added the perforated glass beads and 10 cc. of sulfuric acid (1:1). Boil as before, add 40 cc. of water, and cool, finally adding 100 cc. of 42° Bé. caustic soda and distilling as above. The difference between the ammonia obtained by A and B is that in the form of nitrate.

To determine nitrogen in the form of cyanamide, to a 50-cc. aliquot of solution 3 add excess of 5 per cent silver nitrate solution, and finally 20 cc. of 10 per cent potassium hydroxide solution. Filter and wash the brown precipitate, and determine nitrogen in the residue by the Kjeldahl method, substituting 1 gm. of copper sulfate in place of mercury. This method includes nitrogen present as cyanamide, also that as dicyandiamide.

To determine nitrogen as ammonium sulfate or ammonia salts, transfer a 50-cc. aliquot from solution 2 to a Kjeldahl flask, add 150 cc. of water and excess of magnesium oxide, and distill. The ammonia thus collected indicates that present in the form of ammonia salts. If urea is not present solution 3 may be used, but extraction with alcohol will remove small amounts of urea usually present in organic materials.

To determine nitrogen as urea, transfer 50 cc. of the alcoholic solution 1 into a 500- to 600-cc. Kjeldahl flask, add 50 cc. of water, boil to remove alcohol, concentrating to 40 or 50 cc., add 100 cc. of water, and cool. Add 0.25 gm. urease, connect flask to condenser, and allow to remain cool for half an hour, with frequent shaking. Finally add about 1 gm. of paraffin and 5 gm. of heavy magnesium oxide, and distill until about 100 cc. have been collected in excess standard acid.

Since ammonium nitrate is slightly soluble in alcohol, if this material is present the above procedure should be slightly modified as follows: Transfer 50 cc. of solution 1 into a 500- to 600-cc. Kjeldahl flask, add 75 cc. of nearly absolute alcohol, add magnesium oxide, and distill about 75 cc., collecting in standard acid. The ammonium thus collected would otherwise be determined as urea ammonia in the above procedure. This ammonia recovered should be added to the free ammonia as determined in solution 2.

Satisfactory results were obtained in the analysis of a tankage containing known quantities of all the adulterants named.

A critical evaluation of Hahn's quantitative method for determining protein and proteose, F. B. SEIBERT (*Jour. Biol. Chem.*, *70 (1926), No. 1, pp. 265–272*).—Hahn's method,[1] using 2.5 per cent trichloroacetic acid to precipitate

[1] Biochem. Ztschr., 121 (1921), No. 5–6, pp. 262–272.

the native protein, and phosphotungstic acid to precipitate protein and proteose together, and giving as proteose nitrogen the difference between the nitrogen contents of the filtrates from these two precipitations, was tested with a number of purified proteins and protein derivatives. Pure proteins were not completely precipitated by Hahn's 2.5 per cent trichloroacetic acid reagent, but were quantitatively precipitated by a concentration of 16 per cent of this precipitant. Phosphotungstic acid is not theoretically an accurate reagent for the second precipitation, since it precipitates diamino acids; but in practice, in the cases studied, no significant difference could be demonstrated between this reagent and tungstic acid, which is not a precipitant for the diamino acids.

The modified method consists in precipitating (a) 2-cc. samples of 1 per cent concentrations of the protein preparations by means of 8 cc. of 20 per cent trichloroacetic acid, (b) precipitating 2-cc. samples of the same concentration with 8 cc. of 5 per cent phosphotungstic acid, and (c) determining nitrogen by a micro-Kjeldahl method in the clear filtrates from these two precipitations.

Highly purified ovalbumin, edestin, gliadin, and casein were practically completely precipitated by 16 per cent of trichloroacetic acid and showed only traces of proteose by the modified Hahn method, while Witte's peptone was found to contain 47.63 per cent of the total nitrogen as protein nitrogen and 44.55 per cent as proteose nitrogen. In a proteose preparation 75.28 per cent of the total nitrogen was found as proteose nitrogen, 0.00 as protein nitrogen, and 24.79 per cent as residual nitrogen.

Some sources of error in the determination of phosphoric acid by the molybdate-magnesia method, J. M. McCandless and J. Q. Burton (*Amer. Fert., 66 (1927), No. 9, pp. 44, 46, 56, 58–60, 62*).—Molybdenum was found to be precipitated with the magnesium ammonium phosphate from ammoniacal solutions of ammonium phosphomolybdate, and carbon from the filter paper was always found on breaking up magnesium pyrophosphate ignited over an ordinary burner. Neither the carbon nor the molybdenum could be entirely removed by subsequent heating with a blast lamp. A colorimetric method for determining molydenum capable of showing a distinct difference in color between solutions containing 0.01 and 0.02 mg. of molybdenum oxide was devised for the examination of the ignited magnesium pyrophosphate (see below).

Careful ignition in a muffle furnace yielded pyrophosphates free from both molybdenum and carbon. This is considered the best method. It was found possible, however, to secure a complete oxidation of the carbon and volatilization of the entrained molybdenum by filtering off the magnesium ammonium phosphate on asbestos in a platinum or even in a porcelain Gooch crucible, moistening the precipitate with a few drops of a strong solution of ammoniacal ammonium nitrate, drying carefully, and oxidizing the organic matter below a red heat. For the conversion of magnesium ammonium phosphate to pyrophosphate, a temperature of 1,000° C. is not considered sufficient, and no loss from pure pyrophosphate was observed at temperatures attainable with the blast lamp. The methodic error of this ammonium nitrate oxidation procedure is stated to be not greater than ± 0.05 per cent.

Purified microcosmic salt is recommended as a standard, and the following magnesia mixture formula is given as a means of avoiding the contamination of the reagent, and consequently of the precipitate, with silica: "Dissolve 22 gm. of recently ignited calcined magnesia in dilute hydrochloric acid, avoiding an excess of the acid. Add a little calcined magnesia in excess and boil a few minutes to precipitate iron, alumina, and phosphoric acid. Filter into a two-liter flask. Add hydrochloric acid dropwise, using methyl orange as indicator,

until the solution just reacts acid, then add 1 ml. of 1:1 hydrochloric acid. Add 280 gm. of ammonium chloride, make to mark, and filter into the stock bottle." For use 50 cc. of this stock solution is mixed with 13 cc. of ammonia (sp. gr. 0.90), made up to 100 cc., and filtered just before using. Fifteen cc. of this final mixture is ample for the precipitation of 0.10 gm. of P_2O_5.

Molybdenum was determined in the magnesium pyrophosphate as follows:

"Solutions required.—(1) A solution containing a weighed quantity of c. p. molybdic acid in dilute caustic soda and made up to a definite volume so that 1 ml. contains 0.1 mg. of MoO_3. (2) A 10 per cent solution of sodium sulfide.

"Procedure.—After the magnesium pyrophosphate has been burned and weighed dissolve it in about 10 to 5 ml. of 1:1 hydrochloric acid by digestion at a moderate heat. Filter and wash into a 100-ml. flask, washing the paper with water acidulated with hydrochloric acid. Make up to the mark and pipette 10 ml. into a small porcelain dish. Add 5 drops of the 10 per cent sodium sulfide solution. Molybdenum sulfide will color the solution in proportion to its amount, which may be matched readily from the standard solution diluted to the same volume and acidulated with about the same amount of hydrochloric acid. The matching should be done as rapidly as possible, as the solutions tend to darken on standing."

On the determination of manganese as manganese pyrophosphate [trans. title], D. Balarew and N. Desew (*Ztschr. Analyt. Chem., 70 (1927), No. 12, pp. 444–447*).—An investigation of the Gooch-Austin method[2] for the determination of manganese as manganese pyrophosphate showed that the method is applicable only under very narrowly limited conditions.

A gas analysis apparatus modified for the determination of methane in metabolism experiments, T. M. Carpenter and E. L. Fox (*Jour. Biol. Chem., 70 (1926), No. 1, pp. 115–121, fig. 1*).—This is a description of a new apparatus for determining methane in metabolism experiments. Directions for its use for satisfactory results and its limitations are discussed.

Analysis of maple products.—IX, Effect of centrifugal clarification of maple sirup upon its analytical values, J. F. Snell (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 278–280*).—In further work (E. S. R., 35, p. 416), centrifugal clarification was found to have no appreciable effect upon either the Canadian lead number or the ash content of the two sirups examined. Analyses of the sirups and of the sediments are tabulated.

Polarimetric determination of sucrose in sweetened condensed milk, P. Honegger (*Analyst, 51 (1926), No. 607, pp. 496–503, fig. 1*).—The method of Revis and Payne[3] is stated to be one of the most accurate polarimetric methods, but is complicated and not always dependable. The following modification is proposed:

Weigh and wash into a 110-cc. flask 26 gm. of the milk, using boiling water to make about 90 cc. Heat the flask in boiling water 3 minutes, cool to 20° C., add 3 cc. of acid mercuric nitrate solution, make the volume 100 cc. at 20°, and add a further 4 cc. Shake vigorously 1 minute and filter through a single, folded, hard paper. Take the direct reading at 20° as soon as there is filtrate enough to fill the tube. Heat the solution 7 minutes in boiling water, cool immediately, filter on a double folded filter, and take the invert reading at 20° within 5 minutes after completing the inversion.

The acid mercuric nitrate is prepared by dissolving pure mercury in twice its weight of nitric acid (specific gravity 1.42) and doubling the volume of the solution with water.

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[2] Amer. Jour. Sci., 4. ser., 6 (1898), No. 33, pp. 233–243.
[3] Analyst, 39 (1914), No. 464, pp. 476–479.

With the hard filters recommended in the first filtration, very clear solutions, giving lower results than those from large-pored filters, were obtained. The mutarotation of lactose was found to be eliminated by 3 minutes', but not by 1 minute's boiling. The prescribed heating was found without effect on sucrose readings. The results are to be calculated from the expressions

S (percentage of sucrose) $= \frac{(D-I)\ (100+C)}{141.71-0.5T}$; $C = 10 - [(1.11F + 0.82P) \times 0.26034]$; F=percentage of fat; P=percentage of protein; D=direct reading; and I=invert reading.

Control testing of wood and pulp, E. P. Cameron (*Canad. Chem. and Metall., 10 (1926), No. 11, pp. 255–257*).—The methods for testing wood and pulp, consisting of the determinations of crude cellulose, resistant cellulose, lignin, and resins, are outlined, and their importance in the pulp and paper industries is discussed. These methods are regarded as highly empirical and of little definite chemical significance, but they have a definite meaning in terms of the paper making possibilities of the wood and pulp examined, and as such are extremely valuable to both the paper maker and the pulp producer.

Studies of commercial sauerkraut with special reference to changes in the bacterial flora during fermentation at low temperatures, L. A. Priem, W. H. Peterson, and E. B. Fred (*Jour. Agr. Research* [U. S.], *34 (1927), No. 1, pp. 79–95, figs. 4*).—The literature is reviewed briefly, certain inconsistencies in the published statements concerning the bacteria of sauerkraut fermentation being pointed out. The successive changes in oxygen tension, in pH, in concentration of fermentable carbohydrates, etc., whereby quite different bacterial flora may at different stages of the fermentation become prominent and persist for a time, are noted.

The samples examined were mostly taken from four vats, each of about 40 tons capacity, through spigots placed at the sides and near the bottoms of the vats to avoid disturbing the sauerkraut in drawing the juice. Samples were at first taken frequently, later about once a month. Some samples, obtained from another factory, had been in the vats from 41 days to 1 year. Temperatures were followed in the vats and in the juice samples as drawn. They were low, never rising above 10.5° C., which condition resulted in a relatively slow bacterial development and fermentation. The study covered a period of 5 months. Acidity as lactic acid increased slowly, amounting to 1 per cent after 3 months and 1.3 per cent after 5 months. Bacteria increased rapidly from the second to the twentieth day, after which a large drop was noted. Three hundred and seventy pure cultures were picked from platings, most of these organisms fermenting arabinose, xylose, and fructose, though they caused but little change in litmus milk. Nearly all of these forms were catalase-negative.

Representative cultures, mostly rods with a few cocci, were studied further for fermentation characteristics. Most of these were Gram-positive, about two-thirds formed gas from glucose, and about the same number formed mannitol from fructose, several new mannitol-forming strains being found. Quantitative determinations of the fermentation products of 6 mannitol-forming cultures were made, lactic acid being the principal product, with a variation from 36 per cent produced from glucose to 79 per cent produced from arabinose. These large percentages of lactic acid could not have arisen from a direct pentose cleavage, but must have involved some synthesis from two or more molecules. The *d* and *l* lactic acids were usually formed in approximately equal quantities, but one culture yielded an excess of the levorotatory form. Acetic acid, ethyl alcohol, carbon dioxide, and mannitol were also formed in quantities varying with the sugar and with the culture used.

METEOROLOGY

Manual of meteorology.—Vol. I, Meteorology in history, N. Shaw and E. Austin (*Cambridge, Eng.: Univ. Press, 1926, vol. 1, pp. XX+339, pls. 19, figs. [44]*).—This is the first of a proposed series of four volumes.

Treating the subject historically, this volume brings together "general ideas of the relation of weather and meteorology to humanity at large" under the following chapter titles: Meteorology in European culture; weather and climate in the "world as known to the ancients;" the measurement of time—the calendar and the cycle of the seasons; poets and historians—the applications of meteorology to agriculture and navigation—Herodotus; meteorology in the time of Aristotle; variability of Mediterranean climates in historical times; from Aristotle to the invention of the barometer—weather lore, astrology, and almanacs; the reign of the barometer as weatherglass—pioneers in the science of weather; meteorology as an international science—the meteorological library; the meteorological observatory—the surface air; the meteorological observatory—the upper air; the meteorological laboratory—the study of the atmospheric heat engine and the cycle of physical changes in the general circulation; the development of arithmetical and graphical manipulation; the analysis of air movement into the general circulation and the cyclone; and meteorological theory in history.

[Weather and forest fires] (*Jour. Forestry, 25 (1927), No. 4, pp. 452–477*).—This is a series of papers presented at the 1926 meeting of the Society of American Foresters, as follows: The Objectives of Forest-fire Weather Research, by H. T. Gisborne (pp. 452–456); Weather and Forest Fires, by C. S. Chapman (pp. 457–462); Fire-Weather Forecasts Needed by Fire Control Executives, by R. Headley (pp. 463–466); Weather and Fires from the Standpoint of the Meteorologists, by M. F. Burrill (pp. 467–472); and Weather and Fire Research, by S. B. Show (pp. 473–477).

In these papers the present status of investigation into the causes and conditions favoring forest fires and the use of meteorological data in forest fire prevention are discussed. The need for more observations on which to base prediction of forest fire weather and for further research is especially emphasized. Some of the more important problems requiring investigation are indicated.

The importance of meteorological studies in forest fire prevention, P. W. Stickel (*N. Y. State Col. Forestry, Syracuse Univ., Forest Protect. Conf. Papers, 1926, pp. 58–68, figs. 6*).—As showing the need of meteorological studies, especially with reference to humidity in relation to forest fire prevention, it is stated that "of the total number of days during the spring forest fire season in central Massachusetts, on 21 per cent of the days there was a total of 43 per cent of the fires. This relatively small percentage of fires occurred on days with relative humidities between 10 and 34 per cent; yet these fires burned 91 per cent of the area and caused 88 per cent of the damage."

Report of weather observations, C. H. Steelman (*New Jersey Stas. Rpt. 1925, pp. 142–144*).—Observations at the college farm at New Brunswick, N. J., on temperature and precipitation during the year ended June 30, 1925, are summarized, and the outstanding features of the weather are noted. These were the cool, dry fall of 1924 and the very early spring and the unusually hot and dry June of 1925. The total rainfall of the year was 35.75 in., 12.99 in. below normal. The mean temperature was 52.36° F., 0.59° above normal. The frost-free period in 1925 extended from April 21 to October 22.

Data on the climatology of the Don district [trans. title], V. A. Pogoenpol (W. Pogoenpohl) (*Izv. Donsk. Inst. Selsk. Khoz. i Melior. (Ann. École Supér.*

Agr. et Amélior. Don, Novotcherkassk), *5* (*1922–1924*), *pp. 141–161*).—This is a report of observations in the Don district during the 13 years 1912–1924 on air temperature and pressure, prevailing winds, velocity of wind, evaporation, humidity of the air, cloudiness, and precipitation.

SOILS—FERTILIZERS

A convenient classification of soil and rock types on the basis of their mechanical condition [trans. title], N. A. DIMO (*Izv. Inst. Pochvoved. i Geobot. Sred. Aziatsk. Gosud. Univ.* (*Bul. Inst. Pédol. et Géobot. Univ. Asie Cent.*), *No. 1* (*1925*), *pp. 91–96; Ger. abs., p. 96*).—The soil and rock types were grouped as follows on the basis of mechanical analysis: Clayey soils having a loam to sand ratio of 1:1.5 or less, subdivided into light-clay types 1:1 to 1:1.5, medium, 1:1 to 1:0.5, and heavy, 1:0.5 and less; loamy soils, with a loam–sand ratio of 1:1.5 to 1:4, subdivided into heavy loams, 1:1.5 to 1:2, medium, 1:2 to 1:3, and light loamy soils, 1:3 to 1:4; sandy loams, with the ratio 1:4 to 1:6, not subdivided; sandy soils, from 1:6 to 1:10; and loose sandy soils, 1:10 and higher.

Methods of mechanical analysis of sediments, C. K. WENTWORTH (*Iowa Univ. Studies Nat. Hist., 11* (*1926*), *No. 11, pp. 52, figs. 6*).—The purpose of this paper is to bring together the more important methods of mechanical soil analysis. The collection, notation, and labeling of samples, their preparation, division, and analysis by sifting, by counting, by three-diameter measurement, by weighing, by microscopic counting, etc., are considered in detail, and recommendations are made with respect to suitable equipment and procedure in carrying out these processes. The elutriation analysis of fine sediments is presented in outline, and the methods of computing and plotting mechanical analyses of soils are discussed.

Soil survey of the Coachella Valley area, California, A. E. KOCHER and W. G. HARPER (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. IV+485–535, pls. 5, fig. 1, maps 2*).—In cooperation with the California Experiment Station, the soils of an area of 220,160 acres situated in the south-central part of Riverside County in southern California and lying at elevations ranging from 100 ft. above to 250 ft. below sea level were classified and mapped in 4 series of 15 types (of which Coachella fine sand, 19.2 per cent, occupied the largest area), in addition to 12.6 per cent of rough, broken, and stony land and 3.8 per cent of dunesand, unclassified and of nonagricultural character. The Coachella Valley is surrounded for the most part by barren and rugged mountains except on the southeast, where it borders on desert lands and the Salton Sea.

This survey deals with about the same lands covered in the Indio area survey of 1903 (E. S. R., 16, p. 1060)—the valley floor and the alluvial fans of the foothills—except for a portion of the area inundated by the Colorado River in 1905 and now occupied by the Salton Sea. The rainfall is very slight, the climate is arid, and agriculture depends entirely upon irrigation.

Will County soils, R. S. SMITH, O. I. ELLIS, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 35* (*1926*), *pp.* [*2*]+*61, figs. 5, maps 3*).—Will County comprises an area of 534,310 acres lying at an elevation of the approximate range of 550 to 800 ft. above sea level, in northeastern Illinois. Nearly 16.8 per cent of the area surveyed lies in the Kankakee-DesPlaines terrace. Topographically the county consists of flat to rolling upland, the knob-and-basin formation, terraces, and dunelike sand formations. Drainage is supplied by the Lake Michigan, Kankakee, DesPlaines, and DuPage Basins.

In this report the soils of this region are divided into 4 main groups: (1) Upland prairie soils, usually rich in organic matter; (2) upland timber soils, less rich in organic matter than the prairie soils on account of the more complete decay and forest fires; (3) terrace soils; and (4) swamp and bottom land soils, including flood plains, swamps, and poorly drained lowlands. In these groups 34 types are classified, upland prairie brown silt loam, 65.22 per cent, occupying the largest area. Rocky outcrop, rock quarry, gravel pits, and mine dumps, unclassified, together take up 0.23 per cent of the total area, and water covers 0.97 per cent.

Soils of Valley County, L. F. Gieseker (*Montana Sta. Bul. 198 (1926), pp. 60, fig. 1, maps 4*).—This bulletin reports a preliminary survey, made by the Montana Station in cooperation with the U. S. D. A. Bureau of Soils, of an area of about 3,241,000 acres included in Valley County, northeastern Montana. The county consists of rolling plain intersected by rather deeply intrenched streams and coulees, divided into 4 phases: (1) Level, (2) rolling, (3) sharply rolling, and (4) bad lands. The range in elevation is from about 2,100 to 3,100 ft. above sea level. The Milk River drains most of the county, the remainder, the south and east-central portions, draining to the Missouri River. The entire county lies within the glaciated Great Plains region.

The soils are mapped as 13 types of 10 series, the Daniels gravelly loam and Pierre clay loam covering about 13 and 10 per cent, respectively, of the total area, while about 1.78 per cent consists of bad land basins, unclassified.

Soil survey of Medicine Hat Sheet, F. A. Wyatt and J. D. Newton (*Alberta Univ., Agr. Bul. 14 (1926), pp. VIII+76, figs. 12, map 1*).—Medicine Hat Sheet comprises 2,764,800 acres of undulating and gently rolling to hilly land in the bald prairie region of southeastern Alberta. The area is drained by the South Saskatchewan and tributary rivers. In a survey conducted by the soils department of the University of Alberta, the soils of this area are classified into six definite types together with mixed areas, river bottom, eroded areas, and lakes, unclassified, no serial classification being made. Loams, 45.7 per cent, and silt loams, 23.0 per cent, the latter including 4.9 per cent of a blow-out phase, cover the largest sections of the total area.

There are two appendixes: (1) On soil survey methods and classes (pp. 58–63); and (2) on The Relation of the Geology to the Soils in the Medicine Hat Sheet, by J. A. Allan (pp. 64–76).

Colloids and their importance in the soil, H. J. Page (*Agr. Prog. [Agr. Ed. Assoc., London], 3 (1926), pp. 15–26, fig. 1*).—This paper is a semipopular outline explanation of the nature of the colloidal state, the properties of various types of colloids, and the part played by colloidal clay and humus in soil activity.

Soda in the central Asiatic soil types [trans. title], N. A. Dimo (*Izv. Inst. Pochvoved. i Goebot. Sred. Aziatsk. Gosud. Univ. (Bul. Inst. Pédol. et Géobot. Univ. Asie Cent.), No. 1 (1925), pp. 79–85; Ger. abs., p. 85*).—The sodium carbonate and sodium bicarbonate contents of certain primitive waste-land soils of central Asia are briefly reported, together with theoretical considerations concerning the conditions probably responsible for the development of alkalinity in these soils.

Prevention of wind injury to crops on muck land, P. M. Harmer (*Michigan Sta. Circ. 103 (1927), pp. 8, figs. 5*).—Wind damage to crops on muck land may be greatly lessened by four methods: (1) Maintenance of a good supply of moisture in the soil, (2) compaction of the soil by heavy rolling, (3) addition of organic matter to the soil, and (4) use of windbreaks. The use of all of these methods is advisable.

Studies on soil protozoa, II, III, I. HINO (*Nôgaku Kwaihô* (*Jour. Sci. Agr. Soc.* [*Japan*]), *No. 289* (*1926*), *pp. 517–538, figs. 2; Eng. abs., pp. 107–109*).—Two papers are presented:

II. *Active ciliates in the soil* (pp. 517–527).—In a sandy soil containing 10.8 per cent of moisture, 26 per cent of its water-holding capacity, large ciliate forms were found active, and small ciliate forms were found active in a soil with 8.2 per cent moisture, or 20 per cent of its water-holding capacity. *Colpoda saprophila* was active in a sand culture containing 7.1 per cent moisture (23 per cent of capacity), and in a culture having 13.5 per cent moisture (44 per cent capacity) *Stylonychia* sp. was observed. *C. saprophila* was active from 15 to 36° C. (59 to 96.8° F.). When a favorable temperature was continued for several hours excystment and multiplication of the ciliates was obtained in the laboratory. The field conditions of Japan are exceptionally favorable for protozoa, including the ciliate studied, on account of a high relative humidity and much irrigation for rice growing. The ciliates are stated to be much more destructive to soil bacteria than are the amoebas and flagellates. On the other hand, the author considers them active in promoting nitrogen fixation by Azotobacter, in decreasing soil acidity, and in destroying plant pathogens inhabiting the soil.

III. *Experimental studies in the abolishment of plant pathogenes in soil and water* (pp. 528–538).—Experiments reported indicated the destruction by protozoa in water and in soils of bacteria and fungi pathogenic to plants. *Bacterium citri, B. hyacinthi, Bacillus aroideae, Fusarium* sp., and others were all killed by fairly large inocula of ciliate protozoa. The process is comparable to the protozoic self-purification of water containing typhus, cholera, or dysentery organisms.

Soil microorganisms and activators, A. ITANO (*Jour. Agr. Chem. Soc. Japan, 1* (*1925*), *No. 13, p. 1029; also in Ber. Ōhara Inst. Landw. Forsch., 3* (*1926*), *No. 2, pp. 185–191, figs. 4*).—In experiments on the effect of temperature and pH on the activities of *Bacillus subtilis*, reported from the Ōhara Institute, the spores of this organism germinated at 25 and 37° C. within the range pH 5 to 10, though at pH 10 the vegetative cells multiplied only to a very slight extent, soon passing into the spore state again. Experiments on Azotobacter indicated a multiplication and nitrogen fixation more than double that of the control when either a vitamin (B?) preparation or phytonucleic acid was added to the culture medium. The author considers that vitamin D may have been present in the B preparation used, however.

Experiments on peat showed a marked increase in the nitrogen soluble in alkaline potassium permanganate (Official method) and in amino nitrogen when the peat-water mixture was brought to pH 7 with N/5 sodium hydroxide; a slightly less increase when M/5 disodium hydrogen phosphate replaced the alkali; and a yet smaller, though still marked, increase when calcium carbonate was used. An addition of 1 part in 1,000 of the vitamin B preparation gave increases in the same order of magnitude as the preceding; 1 in 100 of molasses had about twice this effect; peat neutralized with sodium hydroxide and treated with 1 in 1,000 of the vitamin preparation yielded nearly four times the amino nitrogen found in the first group of experiments; the neutralized peat plus 1 in 100 of molasses showed almost as large an increase; and alkali-neutralized peat plus both 1 in 100 of molasses and 1 in 100 of the vitamin preparation gave an amino-nitrogen figure about 5 times as great as those of the first group, or about 51 times that of the peat-water control.

Soil micro-organisms and their relation to soil fertility, M. M. ALICANTE (*Sugar Cent. and Planters News, 7* (*1926*), *No. 10, pp. 730–735*).—A sandy soil

low in organic matter was found to contain 100,000 bacteria per gram, and a sticky, poorly aerated clay showed about the same amount, while good soils under favorable conditions contained from 1,000,000 to 1,000,000,000 organisms per gram. Acid, relatively infertile soils showed low bacterial counts, which increased upon liming and fertilizing the soils.

The most important factors limiting the bacterial nitrification of the Philippine Island soils examined were acidity and excessive clay. A red, sticky soil bearing stunted, yellow cane and found to contain 44.9 per cent of clay and an acidity of 0.15 per cent failed to nitrify additions of ammonium sulfate during an incubation of 28 days. After liming a 16.7 per cent nitrification was secured. A 4 per cent clay soil of 0.05 per cent acidity was found capable of a 14 per cent nitrification of ammonium sulfate. After liming a 94.1 per cent nitrification was obtained, and the soil bore an excellent stand of sugar cane.

Physiological studies of accessory and stimulating factors in certain media, J. R. Sanborn (*Jour. Bact., 12 (1926), No. 1, pp. 1–11*).—*Cellulomonas folia* n. sp., isolated from decaying leaves and found to attack cellulose vigorously with the production of acid, was stimulated by maple leaves sterilized without heat, though not by autoclaved leaves. Extracts from the seeds and seedlings of alfalfa, barley, and buckwheat, as well as vitamine B concentrates, had also a stimulating effect. The change in the pH of the medium is considered a suitable criterion of the physiological efficiency of *C. folia.*

Essential food substances in soil, J. R. Sanborn (*Jour. Bact., 13 (1927), No. 2, pp. 113–121*).—In pot experiments on the decomposition of alfalfa, buckwheat, barley, and red clover used as green manures, the conclusion of Mockeridge (E. S. R., 43, p. 815) that soil bacteria produced growth-accessory substances from organic matter in the soil was confirmed. Extracts from a sandy loam soil in which the green-manure plants had been grown, turned under, and largely decomposed were sterilized by filtration and added to cultures of *Cellulomonas folia* (described above) in a basic nutrient solution, the effect being a marked stimulation, especially by the extract from the alfalfa decomposition. Extracts from the control soil, in which no green manure had been turned under, exhibited negligible stimulating effect. Two gm. samples of raw cotton, placed in 100 cc. of the medium containing extract equivalent to 8 gm. of soil, were destroyed rapidly by *C. folia* in the presence of the extracts of alfalfa-manured and buckwheat-manured soils, moderately rapidly in the presence of the extract of barley-and-clover treated soils, and slowly in the controls. The addition of such extracts to mixtures of sterile sand with sterilized green-manure plants inoculated with pure cultures of both *C. folia* and *Actinomyces colorata* resulted in an almost complete decomposition of the plant tissue in the first three or four days. During this time there was a slight decomposition of the green-manure plants in the control pots. Later the control pots showed the development of the stimulating substances.

The reversion of nitrates in the soil under cultural conditions in Mauritius, N. Craig and F. Giraud (*Mauritius Dept. Agr., Sci. Ser. Bul. 11 (1926), Eng. ed., pp. 19*).—Under the conditions of the experiments reported, large applications of molasses arrested nitrification and caused the conversion of ammonium compounds into organic nitrogen. Large amounts of organic matter in general caused a reversion of nitrate to organic nitrogen, molasses having the greatest effect of the substances tried, with dried green manure second and dried farmyard manure third. Neither molasses nor dried green manures caused loss of nitrogen as gas, but farmyard manure caused a large loss of this kind.

[Soil and fertilizer experiments at the New Jersey Stations] (*New Jersey Stas. Rpt. 1925, pp. 294–308, fig. 1*).—The following experiments are reported:

Legumes v. nonlegumes for soil improvement, J. G. Lipman and A. W. Blair (pp. 294–300).—Parallel 5-year rotations of corn, oats, wheat, and timothy or timothy with clover, in which, in one case, a legume cover crop follwed each of the first two grains and, in the second case, a nonleguminous cover was similarly used, showed the legumes little better than the nonlegumes when the latter were furnished 25 to 30 lbs. of nitrogen per acre as sodium nitrate or as sodium nitrate and ammonium sulfate. Timothy and clover showed a marked advantage over timothy alone, however. The advantage of 50-lb. applications of potash, especially on timothy grown with clover, was clearly shown. Acid phosphate was supplied to all the plats at the annual rate of 300 lbs.

Continuous wheat and rye with and without a legume green manure crop, 1924, J. G. Lipman and A. W. Blair (pp. 300–302).—The slight increase in the 1924 wheat crop (E. S. R., 55, p. 18) from the use of soy beans as a green manure scarcely semed to justify the cost of seeding the beans. The yields on the check plats, cropped with leguminous green manures, have been influenced for several years by volunteer clover, however, and this largely accounts for the present small difference in yields.

Continuous corn with a legume and a nonlegume green manure crop, 1924, J. G. Lipman and A. W. Blair (pp. 302–304).—A continuation of the experiments (E. S. R., 55, p. 19) on this subject showed little difference in yield of dry matter and a difference of but about 1 lb. in total nitrogen between the two crops. Manured plats returned about 10 lbs. per acre more nitrogen than unmanured plats; there was little difference, however, between the results of 1,000 and 4,000-lb. manure applications.

On the decomposition of cellulose in the soil, S. A. Waksman, O. Heukelekian, and C. E. Skinner (pp. 304, 305).—Under aerobic conditions the decomposition of cellulose was found to be largely accomplished by fungi and the rate of decomposition to be definitely related to the quantity of available nitrogen. The ratio of cellulose decomposed to nitrogen converted into fungus protoplasm is about 30 : 1. Organic matter rich in cellulose and poor in nitrogen will only be decomposed in proportion to and at the expense of the available soil nitrogen, so that growing plants suffer in the resultant competition with soil microorganisms for available nitrogen.

Under anaerobic conditions cellulose decomposition is almost wholly bacterial, is slower in beginning but rapid with abundant gas evolution when once started, and requires considerably less nitrogen than does the aerobic fungus decomposition. Two steps in protein decomposition were observed, one group of organisms hydrolyzing native proteins to amino acids, while another group forms ammonia rapidly from amino acids.

Colloidal behavior of soils and soil fertility, J. S. Joffe and H. C. McLean (pp. 305–308).—The suction force of soils as determined by the reduction in pressure in a Pasteur clay filter balloon containing water and surrounded with the soil to be tested was used as an index of the colloid content of soils. The apparatus is illustrated. Pure quartz sand showed practically no suction force. The addition of 5 per cent of bentonite raised the value from 1.2 cm. of mercury to 6.8. Ten per cent of bentonite gave the value 9.8 cm.; 20 per cent, 16.0 cm.; and pure bentonite, 24.0 cm. Liming depressed the suction force in all cases, perhaps by a reduction of the surface energy of the colloids due to coagulation. The ratio, suction force of soil : suction force of colloids $\times 100$ should give the percentage of colloids in the soil. It has been found that this principle can be used to great advantage in estimating the colloid content of the soil.

Fertilizers and crops for marsh soils, A. R. WHITSON, A. R. ALBERT, and O. R. ZEASMAN (*Wisconsin Sta. Bul. 392 (1927), pp. 36, figs. 14*).—On the basis of the station's work, the handling of marsh soils is discussed. Good drainage is regarded as of primary importance, and details of approved drainage practice are given.

Potash is the common factor limiting crop yields, the equivalent of 75 lbs. per acre of muriate annually is recommended for hay and grains and 100 lbs. for potatoes, corn, or root crops. Phosphate is already required on some and ultimately will be required by most of the Wisconsin marshes. Lime is required on some of the marshlands for profitable yields of root crops and leguminous hay. Suggestions as to selection and culture of crops are included.

Losses of phosphoric acid by leaching from upland soils in north Wales, G. W. ROBINSON and J. O. JONES (*Agr. Prog.* [*Agr. Ed. Assoc., London*], *3 (1926), pp. 39–42*).—Experiments made at Penlan, Llangollen, showed that under the heavy rainfall of north Wales (45 in. annual average at Penlan) and in soils usually acid, the leaching of phosphate applied as basic slag is strikingly rapid. The soil tested was a rather heavy noncalcareous silt loam from silurian shales, and was rich in organic matter. Two hundred pounds per acre of basic slag applied in 1914 had disappeared from the upper 18 in. of the soil in 1924. Phosphate added in 1922 was still present in the surface layers, however. The soil phosphorus supply is tentatively divided into (1) natural, stable prosphate and (2) fugitive, added phosphates.

Comparing the usual methods for determining soluble phosphoric acid with an extraction by means of N/5 nitric acid, the authors find the last named the more convenient method and consider it capable of a degree of discrimination not attained by the other methods.

Trials of phosphatic manures, H. R. COOPER and P. B. SEN GUPTA (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1926, No. 4, pp. 176–183, pl. 1*).—A study of the value of various forms of phosphoric acid for the legume mati kalai, apparently used in rotation with tea, is reported. Basic slag, which had been fonnd to have the greatest immediate efficiency on the acid soils tested, was taken as a standard. Various finely ground, hard, Indian apatites, Belgian flour phosphate, bone meal, and superphosphate were found to have comparable efficiencies of from 5.3 per cent (one of the apatites) to 93.3 per cent (superphosphate). Curves showing the rate of increase of mati kalai yields with increasing applications of basic slag and of a Belgian phosphate are presented, and the comparative cost and effectiveness of the various phosphates are discussed.

Effect of potash salts on crop yields, S. B. HASKELL (*Massachusetts Sta. Bul. 232 (1927), pp. 41–51, pls. 2, fig. 1*).—This is a summary and discussion of data accumulated in the long-continued field tests of the station.

Applied to a sandy loam soil without supplementation by animal manures, fertilizer potash had a significant effect on crop yields, potatoes being very responsive, and corn very responsive with respect to stover yield, though less in grain, while on clover-grass mixture the potash markedly increased the proportion of clover. Soy beans were almost unaffected, however, even in potash poor soils. Equivalent quantities of sulfate and chloride of potash showed very little difference in effect except when applied to cane fruits, which seemed to be subject to much more serious winter injury when the chloride was used than when the sulfate was used. Potatoes gave slightly greater increases with potassium sulfate than with the chloride of potash. The practical omission of sulfur or magnesium in the fertilizer treatment of plats of the same soil

type had developed no indication of shortage in either element during 25 years.

Some economic aspects of Texas potash, J. W. TURRENTINE (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 271–274*).—This paper presents a detailed estimate of the commercial possibilities of Texas potash. It is thought that in the Middle West and Southwest it may compete successfully with imported potash.

Potash in Poland, R. H. ALLEN (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Trade Inform. Bul. 449 (1927), pp. II+13*).—The various potash deposits of Poland are described, their exploration and commercial history are summarized, estimates of known resources are given, and some factors affecting the probable development of these resources are briefly discussed. In January, 1927, the production is said to have fallen short of the domestic demand, but the known resources are very large, with exploration still incomplete.

The action of sulfuric acid on cultivated land [trans. title], E. RABATÉ (*Jour. Agr. Prat., n. ser., 47 (1927), No. 11, pp. 215–217*).—In experiments at Cloches, Eure-et-Loire, France, using 1,000 liters per hectare (107 gal. per acre) of a solution of 11.5 liters of sulfuric acid of 53° B. per 100 liters of water, yields were obtained of 30.5 quintals of wheat per hectare (2,715 lbs. per acre) and 25.5 quintals of straw as against 25 quintals of grain and 27 quintals of straw on the untreated plat. Beets under the same conditions, the soil being treated before seeding, also gave markedly greater yields on the treated than on the untreated plats. In another group of experiments rock phosphate incorporated into soil subsequently treated with sulfuric acid for weed destruction gave greater yields than superphosphate. These results are explained as being due to mobilization of soil potash contained in alumino-silicates, to the nutrient effect of added sulfate, and, in the phosphate experiments, possibly to the formation in situ of an especially active superphosphate. The decalcifying action of the acid treatment is said to be comparable to that of ammonium sulfate. The treatment was successful on neutral, or even slightly acid, soils.

Investigations on the effect of boron on plant life, W. E. BRENCHLEY (*Agr. Prog. [Agr. Ed. Assoc., London], 3 (1926), pp. 104, 105*).—Certain plants, especially many of the Leguminosae, require traces of boron, 1 part in 2,500,000 being ample. In the absence of boron the plants die from the apices, anatomical changes, disintegration, and blackening occurring in the tissues. Over 50 elements have failed as substitutes for boron. *Bacillus radicicola* fails to develop normal nodules on broad bean roots in the absence of the necessary traces of boron. Ordinary soils usually furnish sufficient boron for normal plant growth.

Recent developments in the preparation and use of concentrated fertilizers, W. H. ROSS, A. L. MEHRING, and A. R. MERZ (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 211–214*).—The drillability of fertilizers varies with their fineness and moisture content, and with the relative humidity when they are drilled. A table showing the relative hygroscopicity of various fertilizer salts in terms of vapor pressure of their saturated solutions and the humidity of the air in equilibrium with these solutions at 20 and 30° C. is given. Hydrate-forming salts, such as gypsum and acid phosphate, will not cake again after hydration and grinding; but the caking of salts like sodium and ammonium nitrates, due to the knitting together of the crystals when the humidity varies about the point of equilibrium with the saturated solution, is not permanently affected by grinding. The latter salts may be improved by fusion and granulation; and potassium nitrate, which cakes by adhesion of

crystals through a film of moisture formed at relative low humidities, is permanently improved by coating the particles with an insoluble powder, such as peat or precipitated phosphate.

Increased osmotic pressure in the soil solution is suggested as the cause of burning by excessive local concentrations of fertilizer salts, with the corollary that uniform distribution is more important with a low grade fertilizer of high soluble-salt content than with a fertilizer of high plant food concentration.

The manufacture of urea (Floranid) from ammonia and carbon dioxide, the U. S. D. A. Bureau of Soils process for the preparation of potassium nitrate from potassium chloride and nitrogen peroxide, and some other manufacturing methods are outlined.

Fertilizers and the fertilizer industry, P. R. Scott and W. C. Robertson (*Jour. Dept. Agr. Victoria, 22 (1924), Nos. 11, pp. 679–687, figs. 10; 12, pp. 705–715, figs. 8; 23 (1925), Nos. 1, pp. 13–22, figs. 6; 2, pp. 65–73, figs. 6; 3, pp. 147–157, figs. 8; 4, pp. 239–248, figs. 8; 5, pp. 290–295, figs. 4*).—This article describes in detail the manufacture of fertilizers and fertilizer materials prepared and used in Victoria. Materials dealt with include bone and blood, dried blood, blood manure, bone dust, farm-made bone manure, bone fertilizer (i. e., bone dust and rock phosphate and marl or other diluent), castor meal, and superphosphate. The local regulations with regard to labeling are noted in connection with each product.

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A dictionary of the flowering plants and ferns, J. C. Willis (*Cambridge, Eng.: Univ. Press, 1925, 5. ed., rev., pp. XII+727+LIV, figs. 44*).—In this, the fifth edition of the present work, the fourth of which has been noted (E. S. R., 43, p. 148), a number of pages (indicated in the preface) are said to have been rewritten in a style which is to be gradually adopted throughout the book.

Winter botany, W. Trelease (*Urbana, Ill.: Author, 1925, 2. ed., rev., pp. XLII+396, figs. 328*).—This is a second, revised edition of the work previously noted (E. S. R., 39, p. 628).

Respiration in plants, S. Kostytschew [S. P. Kostychev] (*Pflanzenatmung. Berlin: Julius Springer, 1924, pp. VII+152, figs. 10*).—The matters dealt with in this book include aerobic and anaerobic respiration and the relations between the two forms, the chemical processes involved, and respiration involving inorganic substances.

Comparison of the physiological activity of three strains of maize as indicated by the transpiring power, B. R. Fudge (*New Jersey Stas. Rpt. 1925, pp. 345–358, figs. 9*).—The maize plants from which these data were obtained were grown for a study of chlorophyll development as related to leaf area and dry weight, and they were used for comparing their transpiring rates. Comparison of the data shows that the strain having the highest average transpiring index has also the greatest dry weight. This correlation holds for all the strains studied, and this fact is held to indicate that judging by either transpiring power or dry weight the physiological activities of the inbred strains are considerably lower than in the heterozygous strain. It has not been determined whether the transpiring power of these maize strains is directly reduced by inbreeding or whether it is the resultant of the suppression of other physiological processes acting in unison.

Phototropism in foliage leaves [trans. title], W. Denecke (*Mitt. Inst. Allg. Bot. Hamburg, 6 (1924), No. 1, pp. 71–126, figs. 3*).—Studies on phototropism, chiefly in *Malva neglecta* and *Tropaeolum lobbianum*, are detailed.

Interrelation of relative day length and temperature, B. E. Gilbert (*Bot. Gaz., 81 (1926), No. 1, pp. 1–24, figs. 5*).—Growth experiments and chemical analyses carried out with *Xanthium pennsylvanicum* grown under known conditions of temperature and relative day length showed temperature to be a determining factor as to time of flower primordia formation. This temperature effect, however, was closely associated with a response to relative day length. Details are given.

Chemical analyses of high-temperature short-day and low-temperature long-day plants resulted in ascending carbohydrate-nitrogen ratios in both cases as the plants approached flower primordia formation. A marked difference in the magnitude of the ratios was noted.

A marked accumulation of reducing sugars and condensed sugar forms in the low-temperature hypocotyl radicles was noted, suggesting a physiological predetermination influencing the initial stages of growth.

Carbohydrate metabolism in leaves of Nicotiana tabacum [trans. title], D. Tollenaar (*Lab. Plantenphysiol. Onderzoek* [*Wageningen*], [*Meded.*] *12 (1925), pp.* [*4*]+*142*+[*3*], *figs. 9; Ger. abs., pp. 115–137*).—This extended account of tobacco leaf carbohydrate metabolism, abstracted in considerable detail in German, provides a bibliography of 104 titles.

Starch formation, F. M. Andrews (*Ind. Acad. Sci. Proc., 41 (1925), pp. 182–184*).—The present paper deals more particularly with the length of time required for the formation of starch by chloroplasts of different plants (about 12) in full sunlight, weak sunlight, or darkness.

The function of sieve tubes [trans. title], E. Kastens (*Mitt. Inst. Allg. Bot. Hamburg, 6 (1924), No. 1, pp. 33–70, figs. 5*).—This account of the author's study of sieve tubes, chiefly as conducting channels for assimilable substances, besides reviewing the development of studies in this connection and difficulties encountered by the theory, deals also with the sieve tubes as possible conductors of stimulation and of hormones. A bibliography of 112 titles is furnished.

Effect of reduction of the food reserve in the seed on the growth of the oat plant, W. R. Robbins (*New Jersey Stas. Rpt. 1925, pp. 337–345, figs. 2*).—A study was made to determine the effect of a reduction in the initial weight of seed by mutilation of endosperm as compared with unmutilated seeds of the same weight in a pure strain, called Iowar, of Kherson oats. It is stated that seed mutilation has no effect on germination, height, growth as measured by transpiration, or dry weight of plants at maturity. Early growth of the plants was retarded by mutilation, but this was overcome later.

Effect of mutilating soybean seed on the subsequent growth of the plants, E. S. Clark (*New Jersey Stas. Rpt. 1925, pp. 322–332*).—Working with soy beans of the Manchu variety on the influence of mutilation on germination, on pod number, on plant height, on leaf area, and on dry weight, the author, having assembled the data in tabular form, concludes that it is impossible to ascribe any significance to a stimulative or harmful effect of mutilation as such.

Relation of seed weight to variability of soybeans and buckwheat in solution cultures, G. Giobel (*New Jersey Stas. Rpt. 1925, pp. 311–322, figs. 4*).—A comparative study is reported of the variability in the dry weight of soy bean and buckwheat plants when grown in solution cultures from seeds of uniform weight and seeds selected at random for uniform size. No definite relationship could be established between the original weight of individual seeds and the yield in either tops or roots. It was more apparent in case of soy beans than of buckwheat, in which the main fact indicating correlation was that the seeds of lowest weight as a rule produced plants of low weight.

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n buckwheat, tops of extremely low weight appeared to be derived primarily rom seeds of low weight and high top weights as a rule from seeds of medium or high weight. The data emphasize the advantage of selecting seeds by weighing as opposed to the random method in obtaining seeds of a certain rade.

Although the method of selection of seeds has been efficient in checking variability of the tops, no such advantage was obtained for the roots. It seems clear that there is a decided advantage in having seeds of uniform weight. It is held that the variability of soy beans in solution cultures may be minimized by careful seed selection.

Preliminary report on the relations between pigment formation, leaf area, and dry weight of corn grown in sand cultures, H. B. SPRAGUE (*New Jersey Stas. Rpt. 1925, pp. 332–337*).—This experiment was started for the study of relations between the formation of the pigments, chlorophyll A and B, carotin, and xanthophyll, and the development of leaf area and dry weight in strains of corn during growth. The results are detailed and tabulated for the period. Chlorophyll content was found to be more closely related to leaf area than to weight of leaf. On the other hand, carotin formation was more closely connected with dry weight of leaf than with leaf area. Xanthophyll content was found to correspond to the values for carotin. Further experiments are planned to test the validity of these and other observations.

Changes in nitrogen, potassium, and phosphorus content of wheat seedlings during germination and early stages, J. DAVIDSON (*Bot. Gaz., 81 (1926), No. 1, pp. 87–94*).—Wheat seedlings between the age limits in which they are generally used for experimental purposes differed in composition from the stock seed from which they were obtained. They either lost or gained potassium and nitrogen, depending upon their age and the conditions under which they were grown, but changed little in phosphorus content. The results indicate that the gains in nitrogen and potassium were due chiefly to the absorption of materials leached from the ungerminated seeds.

The ungerminated seeds consistently lost more potassium, nitrogen, and phosphorus than did the seedlings. The results, however, do not decide the question as to whether sterile seeds may be naturally deficient in these elements.

It is recommended that in plant nutrition studies the seedlings with which the experiments are started, rather than the stock seed from which they were grown, be used as a standard of comparison.

Toxicity and antagonism in salt solutions as indicated by growth of wheat roots, S. F. and H. M. TRELEASE (*Bul. Torrey Bot. Club, 53 (1926), No. 3, pp. 137–156, figs. 5*).—In work set forth in a previous paper (E. S. R., 56, p. 425), it was found that reliable solution-cultural results may be secured if attention is confined to the first few days of seed germination, and that by means of such tests physiological balance may be demonstrated in a quantitative manner. It is the purpose of the present paper to present results which indicate that the same method may also be used in studying toxicity of single-salt solutions as well as antagonistic effects in mixed solutions. The work was undertaken with the aim of determining whether root elongation of very young seedlings might be used for studies of antagonistic effects.

A study was made of the rate of elongation of wheat roots immersed in solutions containing pairs of the salts potassium nitrate, calcium nitrate, and magnesium nitrate, and in simple solutions of each of these salts. The results of this study indicate that very young wheat seedlings can be satisfactorily used for demonstrating the growth-retarding effects of single-salt solutions and the antagonistic action of mixed solutions. It is shown that, for the salts and

conditions employed, equally toxic simple solution of different salts usually become unequally toxic when these solutions are diluted to the same degree. Antagonism was found to be especially pronounced for mixed solutions of potassium nitrate and calcium nitrate, and of calcium nitrate and magnesium nitrate, but it was much less marked for mixed solutions of potassium nitrate and magnesium nitrate. Some striking differences in appearance of roots grown in single-salt solutions are described which indicate that each salt has specific toxic effects.

The influence of salts on the alternation of concentration of cell-sap in plants, W. S. Iljin (*Plant Physiol. Lab. Charles Univ., Prague, Studies, 2 (1924), pp. 5–25*).—Studies are outlined with tabulations and deductions as carried out with different plants. In experiments described, monovalent metals caused the appearance of osmotically active soluble substances in the cell. In general the action of salts on living cells is in intimate relation to the phenomenon of adsorption. Salts enter into close contact with the colloids of the cells and differentiate their properties.

Chemical composition of etiolated and green Berberis sprouts and their respective roots, E. R. Schulz and N. F. Thompson (*Bot. Gaz., 81 (1926), No. 3, pp. 312–322, figs. 2*).—Studies of conditions bearing upon problems of eradication have supplied facts regarding metabolic processes going on within the barberry plant (*B. vulgaris*). These facts are tabulated, with discussion.

Sprouts grown in light or in darkness from roots of *B. vulgaris* differ markedly in chemical composition, photosynthesis being absent in the latter case, and growth and respiration are supported by the translocation of root products, which are rich in nitrogenous materials and more so in carbohydrates. Sprouts growing in the light may draw upon the reserve material stored in the roots as well as synthesize new materials. From this it would appear that the etiolated sprouts should be less abundantly supplied with carbohydrates than the green sprouts. The results show, however, that carbohydrates, such as reducing sugars, total sugars, and starch, were higher in etiolated than in green sprouts.

The roots of the etiolated and green sprouts, respectively, did not show marked differences or even an appreciable decrease in nutritive storage materials due to translocation and utilization of such materials by the developing sprouts. The experiment was too short to affect markedly the rich storage supply of the root.

Relations between the blade and root production in isolated leaves [trans. title], M. Součková (*Plant Physiol. Lab. Charles Univ., Prague, Studies, 2 (1924), pp. 26–35*).—The formation of roots determines the measure of growth in leaves. Particulars are given regarding the formation and development of roots and their structures.

The specific electrical conductivity of the leaf tissue fluids of phanerogamic epiphytes, J. A. Harris (*Bul. Torrey Bot. Club, 53 (1926), No. 4, pp. 183–188*).—Determinations of the tissue fluids of a number of phanerogamic epiphytes from subtropical habitats of southern Florida have shown that the low values of osmotic concentration are in agreement with earlier series from Florida and Jamaica. Variableness in the specific electrical conductivities is due supposedly to the fact that some of the species were under the influence of the greater salinity of strand conditions. Though the conductivities are much lower than those of terrestrial species in saline regions, they are of the same general order of magnitude as the lower values of herbaceous forms in nonsaline regions. It is apparent that the tissue fluids of epiphytic plants are by no means poor in conducting solutes.

Variations in some plants associated with changes of water level during growth [trans. title], L. Daniel (*Rev. Bret. Bot. Pure et Appl., 1924, pp. 71–80, figs. 11*).—Studies were carried out with *Ranunculus nodiflorus*, *R. flammula*, *Bulliardia vaillantii*, *Plantago coronopus*, *Anthemis nobilis*, *Sedum anglicum*, and *Cardamine pratensis*. In connection with changes in water level, alterations were observed in characters of parenchyma, endodermis, chlorophyll, and starch.

Development of flowers and seed in the sugar beet, E. Artschwager (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 1, pp. 1–25, pl. 1, figs. 15*).—The results are given of a study of the flower and seed development of the sugar beet.

Cooperation and conflict of reflexes which determine body form in Araucaria excelsa, J. Massart (*La Coopération et le Conflit des Réflexes que Determinent la Forme du Corps chez Araucaria excelsa R. Br. Brussels: Acad. Roy. Belg., 1923, pp. 32, pls. 12, figs. 10*).—There are said to be in *A. excelsa* reflexes originating internally along with reflexes originating externally. These may at times be opposing, at others concurring, and at still others succeeding or alternating, so that a coordination of reactions is recognizable.

Effect of thiourea upon bud inhibition and apical dominance of potato, F. E. Denny (*Bot. Gaz., 81* (*1926*), *No. 3, pp. 297–311, figs. 7*).—Solutions of thiourea (NH_2CSNH_2) caused the growth of two or more (often four or five) buds from a single eye of the potato. This result was not caused by any other chemical at the concentrations and treatment periods tried, although more than 200 chemicals representing various classes of chemical compounds were tested. None of several urea and thio compounds showed the consistent results that were obtained with thiourea. Next to thiourea in this respect were the thiocyanates. The relation of these and other facts cited to certain theories regarding the cause of the inhibition of basal buds by tip buds is discussed.

The nature and cause of secondary sexual states with special reference to Typha, J. H. Schaffner (*Bul. Torrey Bot. Club, 53* (*1926*), *No. 4, pp. 189–208*).—The species *T. latifolia* and *T. angustifolia* were selected for special study in connection with the nature and cause of secondary sexual states, and the alterations and progression in sex expression obtained are discussed. From the experiments on reversals in diecious species and observations on the sharply bounded limits of male and female tissues, it appears that in plants there are no hormones produced which are readily diffusible from one cell to the other. Sexuality manifests itself in several progressive or orthogenetic stages in organisms in general, which are summarized.

Quantitative relations between temperatures and quickness of killing of plant cells by heat [trans. title], R. Collander (*Soc. Sci. Fennica, Comm. Biol., 1* (*1924*), *No. 7, pp. 1–12, fig. 1*).—Rapidity of heat killing (or its converse, survival period under heat) was tested in studies with several plants, the data from which are tabulated for *Tradescantia discolor*, *Beta vulgaris*, *Brassica oleracea*, *Elodea densa*, *Draparnaldia glomerata*, and *Pisum sativum*. Supposedly the temperature coefficients found indicate that high temperatures denatured either nitrogenous constituents or enzyms.

Bacteria in the roots of Gleditsia triacanthos L., G. M. Friesner (*Ind. Acad. Sci. Proc., 41* (*1925*), *pp. 215–224, figs. 6*).—This paper is concerned primarily with the results obtained from a study of roots of *G. triacanthos*. Work was also begun on *Robinia pseudo-acacia*, *Cercis canadensis*, and *Gymnocladus dioica*. *G. triacanthos* produces cylindrical swellings 10–15 mm. in length on the main axis of the smaller roots instead of the exogenous nodules

ordinarily found on leguminous plants. Bodies resembling involution forms of bacteria are found within the central cylinder of the root near these swellings. These involution forms may be isolated and grown on laboratory media, from which stained smears again yield the same variety of shapes. Laboratory inoculation of seedlings grown in sterile sand and watered with nitrate-free Knop's solution yields typical root swellings from which the organism may again be isolated. Root systems of inoculated plants were much more vigorous than those of uninoculated plants when both were watered with nitrate-free Knop's solution.

Cerophilous fungi [trans. title], H. MOLISCH (*Tôhoku Imp. Univ., Sci. Rpts., 4. ser., 1 (1925), No. 2, pp. 123–134, pl. 1*).—Studies are indicated as carried out with fungi found on or beneath the waxy stem surfaces of canes and other plants, the object being to show that the presence of wax conditions the localization of the organisms.

GENETICS

A manual of plant breeding for the Tropics, N. B. MENDIOLA (*Manila: Univ. Philippines, 1926, pp. XXVIII+365, pls. 13, figs. 65*).—Intended primarily for conditions in the Philippine Islands, this book discusses the possibilities of plant breeding in the Philippine Islands and elsewhere in the Tropics, reviews important genetic facts, and describes errors in plant breeding work and ways to minimize them. Chapters are devoted to improvement work with rice, sugar cane, corn, tobacco, coconuts, abaca, minor crops, fruits, and ornamentals. An extensive list of literature is cited.

The inheritance of production characters in domestic Finnish cattle [trans. title], T. TERHO (*Statens Lantbruksförsöksverks. [Finland], Vetensk. Pub. 4 (1926), pp. 158; Ger. abs., pp. 147–157*).—From studies of records of milk production, fat percentage, length of lactation period, and percentage of total milk production in different months in Finnish cattle, the author found that the offspring of most of the bulls corresponded in average production to that of the average level of the herds, but that the offspring generally varied from the average in the direction of the production of the dam. The sire's influence on fat production was more pronounced than on milk production, but sires and dams were frequently heterozygous for both characteristics. It was impossible to determine whether the milk production factors of the sires were or were not transmitted to the sons. It was likewise impossible to estimate from the ancestry whether an individual was likely to be relatively homozygous or heterozygous as concerned production factors. The importance of environment and feeding on milk production was pointed out as a disturbing factor.

Dominant black in cats and its bearing on the question of the tortoise-shell males, K. TJEBBES and C. WRIEDT (*Jour. Genetics, 17 (1926), No. 2, pp. 207–209*).—The results of F_1 and F_2 matings of Siamese and tabby cats are presented, which indicate the operation of a factor for black dominant to the wild type. In another mating of a Siamese (genetical black) female with a striped yellow male, three tortoise young were produced, of which two were males and one was a female. It is suggested that the occurrence of tortoise shell may be due to the presence of genes in the Y chromosome and to the crossing over between genes in the X and Y chromosome.

Dr. Vriesendorp's theories of color in poultry [trans. title], K. TJEBBES (*Genetica [The Hague], 8 (1926), No. 5, pp. 501–506; Eng. abs., pp. 505, 506*).—The author has crossed Wyandotte, Hamburg, White Leghorn, and Barneveld birds, secured from I. Vriesendorp, on which the latter has advanced the quantitative hypothesis of color inheritance, chiefly in poultry but also in other

animals.[4] The results of the few crosses did not bear out the hypothesis suggested, but did show that the White Leghorns used were recessive for dominant white.

High fecundity in Leghorns as an inherited character, G. W. Hervey (*New Jersey Stas. Rpt. 1925, pp. 192–195*).—Observations of the egg records of dams, sires' dams, and daughters in the New Jersey egg laying contests indicated that high egg production is not transmitted as a sex-linked character, and from the mass standpoint it was not possible to show any relation between production of parents and of offspring. Fecundity is evidently complicated in its mode of inheritance, but it appears to be subdivided into seasonal cycles, the 4-month winter cycle giving the best indication of the annual production provided the stock is mature on November 1. If such is not the case the records for late summer production must also be included in estimating annual production.

The genetics of hen-feathering in chickens, H. W. Feldman (*Amer. Nat., 61 (1927), No. 672, pp. 91–94*).—From a study of the F_2 and F_3 generations produced from crosses of two strains of Golden Sebright Bantams differing markedly in feather shape, length, and color, as well as in other characters, the author has concluded that the principal factor for hen feathering was present in both strains, but that its effects were partially masked by different sets of factors. The crossing of the two strains produced individuals which were atypically hen feathered, with considerably more length of feathers than is customary in Sebright Bantams. Such individuals correspond in certain essentials to the intermediate males reported in other investigations of hen feathering.

Biological investigations of twins with special reference to the question of the etiology of birthmarks [trans. title], E. Meirowsky (*Arch. Rassen u. Gesell. Biol., 18 (1926), No. 3, pp. 270–296, pls. 2, figs. 16*).—From studies and observations of the relation of certain irregularities in characters, such as eye color, hair color and whorls, pigmentation, ear characters, finger prints, etc., in the two individuals of pairs of monozygotic twins and in double-headed monsters, the author concludes that birthmarks result from hereditary causes.

An inherited anomaly of dentition, O. A. Beadle (*Jour. Genetics, 17 (1926), No. 2, pp. 199–206, pl. 1, fig. 1*).—An account is given of the sporadic absence of a varying number of teeth in both sets in the individuals of three generations. Of the original parents, the father had abnormal teeth while the teeth of the mother were normal. Teeth were missing in 5 of the 10 children. The normal children which married produced normal offspring, while 3 of the 5 offspring produced by the abnormal children had missing teeth. No other abnormalities were associated with the absence of teeth. The condition is explained as due to a dominant Mendelian factor.

Do albino rats having ten generations of alcoholic ancestry inherit resistance to alcohol fumes? F. B. Hanson and F. Heys (*Amer. Nat., 61 (1927), No. 672, pp. 43–53, fig. 1*).—In studying the possibility of individuals (the descendants of parents which had been treated with alcohol fumes for several generations) inheriting a resistance to alcohol, 30 of the F_1 generation offspring from the tenth alcoholic generation used in previous studies (E. S. R., 51, p. 130) were compared with 30 individuals of the control stock for the alcohol experiment. Both lots were treated with alcohol fumes until the individuals were completely overcome, on five consecutive days, in air-tight chambers. The length of time required was used as the measure of resistance. The slight differences observed indicated, if anything, a greater resistance of the controls.

[4] Tijdschr. Diergeneesk., 52 (1925), No. 9, pp. 431, 432.

The results of these experiments with alcohol at the Washington University, St. Louis, have so far given no support to the theory of the inheritance of acquired characters.

Recent observations on graft hybrids and on heredity in grafted plants [trans. title], L. Daniel (*Rev. Bret. Bot. Pure et Appl., 1924, pp. 1–70, pls. 36, figs. 5*).—The two parts of this contribution are separate and systematic as to data and conclusions in each part. The literature cited includes liberal references to the author's own articles of earlier dates.

Variability in the linkage of two seed characters of maize, G. N. Collins and J. H. Kempton (*U. S. Dept. Agr. Bul. 1468 (1927), pp. 64, figs. 5*).—Some of the significant differences in the rate of crossing over between *C*, necessary for aleurone character, and *Wx*, differentiating horny and waxy endosperm, were studied, using material which largely arose from a cross between Chinese waxy corn and a colored pop corn from Algeria.

Comparison of the variability of the linkage between *C* and *Wx* with that for other linked genes in corn showed that the *C-Wx* linkage is no more unstable than that for other linked pairs. The crossover rate was more variable in some progenies than in others but was not more variable in male than in female gametes, in upper than in lower ears, in the base than in the ear tip, in old than in fresh pollen, or in the first than in the last gametes formed. Crossing over appeared less variable in several samples of the same individual than in single samples in several individuals and in samples from different parts from the same male inflorescence than in samples from several inflorescences. The crossover ratio was found more variable than Mendelian ratios. Variability in a crossover class did not seem to be the result of differential death rate of zygotes. Variability of rate of crossing over was alike in plants heterozygous and homozygous dominant for *R*.

The rate of crossing over between the *C-Wx* genes was also considered at length. Crossing over was greater in some progenies than in others, and the proportion of crossover to noncrossover gametes was not affected by the vitality of pollen. Crossing over was reduced by the *R* aleurone factor in a heterozygous condition. Rate of crossing over between *C* and *Wx* seemed to be associated with the *Su* factor, and appeared to differ in the two sexes, in the upper and lower ears of the same plant, and in the base and tip of the same ear. Neither length of silk nor variations in meteorological conditions during anthesis were factors in the rate of crossing over. The rate was similar in the first and last pollen shed. Correlations for a number of characters are tabulated and discussed.

Linkage phenomena in wheat, E. Malinowski (*Jour. Genetics, 17 (1926), No. 2, pp. 157–185, pls. 4, figs. 14*).—Considering chiefly sizes and shapes of glumes and spikelets (assumed to be determined by a large number of factors located in several chromosomes) in crosses between hexaploid species of wheat, between tetraploid species, and between tetraploid and hexaploid species, *Triticum polonicum* × *T. vulgare* gave the greatest and *T. dicoccum* × *T. spelta* the least heterogeneity in the F_2 generation. This may indicate that *T. dicoccum* and *T. spelta* have certain chromosomes in common. There may exist at least one common chromosome in *T. dicoccum* and *T. vulgare*. The supposed relationships between wheat species as shown schematically are *T. polonicum* (a)-(b), *T. dicoccum* (a)-(c), *T. durum* (c)-(d), *T. vulgare* (c)-(d)-(e), and *T. spelta* (a)-(c)-(e).

Natural crossing in oats at Morgantown, West Virginia, R. J. Garber and K. S. Quisenberry (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 191–197*).—An investigation showed the extent of natural crossing between varieties of

Avena sativa to be relatively low at the West Virginia Experiment Station, only one natural cross being found among 7,742 plants examined during 3 years. On the other hand, as much as 0.91 per cent of natural crossing was observed between Fulghum (*A. byzantina*) ♀ and Victor (*A. sativa*) ♂, the average being 0.41 per cent based on 1,708 plants. Meteorological data suggested that the weather may influence natural crossing in oats. The black seeded forms found in Fulghum in this experiment seemed due to natural crossing and not to mutation.

Artificial hybridization in rice, K. RAMIAH (*Agr. Jour. India, 22 (1927), No. 1, pp. 17–22, pl. 1, fig. 1*).—A method used in crossing rice at Coimbatore is outlined, with notes on the response of several varieties to temperature and inclosure.

Note on a chinchilla-Japanese cross in rabbits, R. C. PUNNETT (*Jour. Genetics, 17 (1926), No. 2, pp. 217–220, fig. 1*).—Evidence is presented from the offspring of a chinchilla doe mated with 2 Japanese bucks which indicates that the yellow of the Japanese is of the same nature as the yellow of ordinary yellow rabbits. The 5 agouti F_1 does produced, when mated with the black F_1 male, gave 6 color classes, viz, agouti, black, and Japanese, together with the 3 corresponding forms in the chinchilla series. When grouped according to yellow selfs, white selfs, yellow Japanese, and white Japanese, these gave the ratio 58 : 19 : 15 : 4, which is considered sufficiently close to a 9 : 3 : 3 ratio to preclude the likelihood of any linkage between the characters concerned and indicates that the yellow of the Japanese is identical with the yellow of other rabbits. The chinchilla black was found to be indistinguishable from an ordinary black except by the eye color.

On the topography of the sex-chromosome in fowls, A. S. SEREBROVSKY and E. T. WASSINA (*Jour. Genetics, 17 (1926), No. 2, pp. 211–216*).—In studies at the Anikowo Genetical Station the following amounts of crossing over have been observed between genes located in the sex chromosome: Barring and silver 43±5.6 per cent, barring and the factor for inhibition of the rate of feathering 44±3.6, yellow shanks and inhibitor of the rate of feathering 49±5.9, and silver and inhibitor of the rate of feathering 19±3.7 per cent. Only two possible crossovers were observed between barring and yellow shanks among 69 individuals. From these data it is suggested that the barring and yellow shank factors are located close together at one end of the chromosome and the factors for silver and inhibition of the rate of feathering near the other end, the last named being more distant than the silver from the location of the barring and yellow shank color genes, which are evidently very closely placed.

The mammalian sex-ratio, A. S. PARKES (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 2 (1926), No. 1, pp. 1–51*).—Essentially the material previously noted (E. S. R., 51, p. 230), with the incorporation of new material mainly from the studies of the sex ratio and related phenomena (E. S. R., 56, p. 71).

Changes in the ovary of the mouse following exposure to X-rays.—Part I, Irradiation at three weeks old, F. W. R. BRAMBELL, A. S. PARKES, and U. FIELDING (*Roy. Soc. [London], Proc., Ser. B, 101 (1927), No. B 706, pp. 29–56, pls. 4, figs. 7*).—In continuing the studies of the oestrous cycle in the mouse (E. S. R., 56, p. 664), the histological changes in the ovaries of 47 mice exposed to X-ray irradiations are described. Such irradiations were found to be followed by degeneration of all of the oocytes, the membrana granulosa, and the theca interna when present, the resulting small cavities containing zona pellucida remnants. Large follicles show some irregularities in that they become filled with blood and cystic, or form atretic corpora lutea which persist indefinitely without affecting the oestrous cycle. In such cases the old interfollicular

tissue atrophies and the germinal epithelium often proliferates epithelial cords, which become luteal tissue in some cases, and a second proliferation from the germ tissue follows.

Preponderance of dicoccum-like characters and chromosome numbers in hybrids between Triticum dicoccum and Triticum vulgare, W. P. Thompson and L. Hollingshead (*Jour. Genetics, 17 (1927), No. 3, pp. 283–307*).—A cytological examination at the University of Saskatchewan of 28 F_2 hybrids between *T. dicoccum* (14) and *T. vulgare* (21) revealed a great preponderance of low chromosome numbers approaching that of the *dicoccum* parent and the absence of those approaching the *vulgare* number. F_3 results were similar. Study of 20 pairs of characters, distinguishing the parents, in the 28 and in additional F_2 showed most of the individual plants to be dicoccum-like in species-distinguishing characters, while the remainder were intermediate. *Dicoccum*-like plants had 14 bivalent chromosomes, and the few intermediate plants had 15 to 17 bivalents. *Vulgare*-like combinations of characters and chromosome numbers are said to be very rare. The influence of chromosomes additional to the 14 in determining *vulgare* characters is discussed, with remarks on investigations to account for missing expected types. Combining, through breeding operations, desirable qualities of *dicoccum* with those of *vulgare* will be very difficult because of the correlation of *dicoccum* characters, and particularly because of the rarity of *vulgare*-like segregates.

Variations in the chromosome numbers in several Solanaceae [trans. title], R. de Vilmorin and M. Simonet (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 3, pp. 164–166, figs. 4*).—Attention is called to departures from the apparently basic or typical chromosome number (12) in the Solanaceae, notably in *Petunia violacea* and perhaps in *Nicotiana alata* and several other *Nicotiana* species.

The chromosome number in Dactylis glomerata (cocksfoot), J. G. Davies (*Nature [London], 119 (1927), No. 2989, pp. 236, 237*).—Examination at the Welsh Plant Breeding Station at Aberystwyth established that the chromosome number in orchard grass (*D. glomerata*) is 14 haploid and 28 diploid. The technique is indicated briefly. Investigation of the chromosome number in *Arrhenatherum avenaceum* and *Phleum pratense* is in progress.

Chromosome numbers in buckwheat species, K. S. Quisenberry (*Bot. Gaz., 83 (1927), No. 1, pp. 85–88, pl. 1, figs. 7*).—Cytological studies at the West Virginia Experiment Station on varieties of *Fagopyrum esculentum*, *F. tataricum*, and *F. emarginatum* revealed neither differences in chromosome numbers (the diploid in all cases being 16) nor consistent variations in size of chromosomes within a given cell.

The inheritance of length of style in buckwheat, R. J. Garber and K. S. Quisenberry (*Jour. Agr. Research [U. S.], 34 (1927), No. 2, pp. 181–183*).—An investigation at the West Virginia Experiment Station showed that the inheritance of style length in *Fagopyrum esculentum* is apparently controlled by a single factor difference, short styles being dominant to long.

Self-fertilization in buckwheat, R. J. Garber and K. S. Quisenberry (*Jour. Agr. Research [U. S.], 34 (1927), No. 2, pp. 185–190, fig. 1*).—Varieties of *Fagopyrum tataricum* proved to be much more highly self-fertile than varieties of *F. esculentum* in breeding work at the West Virginia Experiment Station. Large glassine bags and muslin cages were the most satisfactory of methods used in covering flowers and inducing self-fertilization. Various manipulations of previously covered flower clusters did not result in a marked increase in quantity of selfed seeds set. As measured by the number of selfed seeds set, short styled plants of *F. esculentum* were somewhat more self-fertile

than long styled plants. Silverhull buckwheat produced relatively more selfed seeds than Japanese buckwheat.

The origin of fatuoids in cultivated oats, C. L. Huskins (*Nature [London], 119 (1927), No. 2984, p. 49*).—Further studies (E. S. R., 56, p. 27) have revealed three additional types of heterozygous fatuoids, of which the Mendelian segregation and cytological peculiarities are described briefly. The close correlation between cytological conditions and genetic behavior in these different types of fatuoids seemed to indicate that fatuoids arise from normal oats not by either gene mutation or natural crossing, but by any one of several different chromosomal irregularities which upset the normal chromosome balance and permit the expression of other characters.

The behaviour of polyploids, C. D. Darlington (*Nature [London], 119 (1927), No. 2993, pp. 390, 391*).—Observations by the author on *Prunus* spp. analogous to those of Huskins, considered together with the work of others on Nicotiana, Primula, Brassica-Raphanus, and Triticum, led to the conclusions that the possibilities of segregation in a functional polyploid are enormously enhanced as compared with those in a comparable diploid, that a pure line of a polyploid species may retain the heterosis of an interspecific F_1 when selfed, and that crossing such a line with a related species exposes the latent heterosis, causing appearance of new and extreme forms and failure to recover the parental form.

FIELD CROPS

[Agronomic experiments in New Jersey], L. G. Schermerhorn, G. W. Musgrave, and H. C. McLean (*New Jersey Stas. Rpt. 1925, pp. 14–16, 35, 36, 148–151, 249–274, 308–310, figs. 6*).—Further studies (E. S. R., 55, p. 31) included comparisons of potato seed sources and sizes; fertilizer trials with sweet potatoes; variety tests with winter wheat and rye, spring wheat, oats, and barley, timothy, red clover, alfalfa, and lespedeza; and breeding work with corn. Competition in potatoes (E. S. R., 55, p. 336) and the correlation of yield of straw and grain in oats (E. S. R., 54, p. 831) have been noted elsewhere.

As in previous years a higher gross acre yield was had as the quantity of seed potatoes used was increased, whether the heavier seeding rate was due to closer spacing or to larger seed pieces. The larger seed pieces produced more stems per plant. The average percentage of seconds or culls increased about 10 per cent as the spacing narrowed from 22.5 to 6 in. in the row. Comparisons made with 0.5-, 1-, and 1.5-oz. seed pieces at a constant seeding rate indicated that the smaller seed piece was more efficient under the experimental conditions. The returns in bushels of crop per bushel of seed used dropped as the quantity of seed per acre rose. Applying prices prevailing over a 9-year period in central New Jersey, return on the investment in seed used decreased as the acre cost of seed increased.

Fertilizer trials on Sassafras gravelly sandy loam at Vineland indicated that for this particular soil small applications of sulfur and of rock phosphate tend to increase the yield of sweet potatoes.

[Maryland Crop Improvement Association], J. E. Metzger (*Md. Agr. Soc., Farm Bur. Fed., Rpt., 10 (1925), pp. 271–317*).—Papers presented at the nineteenth annual meeting of this organization at Baltimore in January, 1926, included Some Information on Wheat Types and Varieties for Maryland, by W. B. Kemp; Oats and Oat Varieties for the Eastern Atlantic States with Special Reference to Maryland, by T. R. Stanton; Production of Seed Corn in Maryland, by A. D. Radebaugh; Simplified Practice in Commercial Fertilizers,

by A. G. McCall; and The Maintenance of Fertility on Limestone Soils, by F. D. Gardner.

[Reports of the Dominion cerealist for the years 1924 and 1925], L. H. NEWMAN (*Canada Expt. Farms, Cereal Div. Rpts. 1924, pp. 31, figs. 2; 1925, pp. 34, fig. 1*).—Agronomic and yield data are tabulated from the results of varietal trials in 1924 and 1925 and in previous years with spring and winter wheat, emmer and spelt, oats and barley for grain and hay, winter rye, field peas, field beans, and flax and hemp for seed. Other activities reported on include the development of rust-resistant wheats, milling and baking tests with wheat, production of elite and registered seed, malting tests with barley, and investigations of experimental methods.

[Field crops experiments in Bengal], R. S. FINLOW ET AL. (*Bengal Dept. Agr. Ann. Rpts. 1923–24, pp. 8–10, 14, 15, I–III, VI–IX, XI–XIII, XIV, XV, XVI–XXI, LXXXII–LXXXIV, LXXXVIII–XCIII, CXXXVI–CXLII; 1924–25, pp. 4–9, 13, 14, II–III, V–VII, X–XII, XIV, XV, XVI, XVII, XIX–XXIV, CIV–CXIX, CXCI–CXCV, fig. 1*).—Progress is reported of investigations along the lines noted earlier (E. S. R., 53, p. 632).

The physiological nature of winter and spring forms of cereals [trans. title], N. A. MAKSIMOV (MAXIMOW) and A. I. POĬARKOVA (POJARKOVA) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 211–234, figs. 3; Eng. abs., pp. 232–234*).—Experiments at the Leningrad Botanical Garden, concerned with the causes of the prevention of spike formation in spring-sown winter cereals (wheat and rye), led to the conclusions that winter forms do not require winter rest in order to produce spikes, nor is the lowering of the germination temperature to about 0° C. indispensable to the heading out of winter cereals during their first development season. However, winter wheats whose seed germinated at a lower temperature (2–5°) form spikes notably earlier than those germinating at a higher temperature (15–20°). With late seedings the accelerating influence of low germinating temperatures may enable such wheat to head out before the end of the vegetative period, while the other plants remain in the tillering stage. The heading of rye seemed independent of temperature conditions during germination, even when seeding is delayed. The temperature during the development of the winter wheat may also influence the time of heading. The freezing of the swollen grains greatly impairs their germinability in wheat as well as rye, retarding also, in wheats at least, the exsertion of the spike. The duration of the period of daylight appeared to be another important factor. A distinct antagonism was apparent in cereals between the vegetative and reproductive growth, i. e., tillering and heading. Winter wheats suffer less from lack of light during the winter months in the greenhouse and therefore may be considered more shade resistant than spring wheats. Tillering in winter wheats likewise proceeds with less intensity of light than in spring forms.

Winter forage and cover crops, P. TABOR (*Ga. Agr. Col. Bul. 321 (1926), pp. 20, figs. 13*).—Data obtained during the seasons 1922–23 to 1925–26, inclusive, on the yields, development, recuperative ability, blooming periods, and composition of winter forage and cover crops and from seeding and grazing trials therewith are reported, together with the results of fertilizer and seeding tests with hairy vetch and comparative tests of grasses, vetches, bur clovers, clovers, sweet clovers, and miscellaneous legumes at Athens and other localities in Georgia.

Effect of time of cutting hay (*Scot. Jour. Agr., 9 (1926), No. 3, pp. 313, 314*).—While a 2 weeks' difference in the cutting of hay has not led to great increases or decreases at Craibstone, Scotland (E. S. R., 54, p. 434), very late

cuttings invariably gave poorer yields. Analyses showed that the hay cut early contained about 10 per cent more leaf and was of much better feeding quality than that cut late. The aftermath from the early cutting was often worth twice as much, and the pasture in the second year was much higher in quality, especially in its white clover content. Growth made by late-flowering red clover in mixtures after the other clovers and grasses were mature was offset by the loss of the finer leaves. A marked depression of the development of white clover, orchard grass, and timothy was observed when the late-flowering red clover in the mixture was allowed to approximate full growth.

Roots and root-growing, P. A. Boving (*Brit. Columbia Dept. Agr. Bul. 98 (1926), pp. 27, figs. 16*).—Practical information presented for the production and utilization of root crops in British Columbia is supplemented by special cultural recommendations for mangels, swedes, turnips, carrots, rape, kale, and cabbage. The results of extensive varietal, fertilizer, seeding, thinning, and spacing tests with different classes of root crops are cited.

Experiments in veld management.—First report, R. R. Staples (*Union So. Africa Dept. Agr., Sci. Bul. 49 (1926), pp. 35, figs. 22*).—Investigations at the Cedara, Natal, School of Agriculture, were concerned with the different effects of burning, grazing, mowing, and cultivation on pastures and their botanical composition.

Observations since 1921 indicated that the botanical composition of the *Themeda triandra burchelli* (rooigras) consociation can be decidedly influenced by grazing and burning. If not grazed, the dominant grass (rooigras) can withstand annual burning between June and September. This type of rooigras veld, even when covered by unburnt dead litter of three seasons was not impaired by proper burning. Earlier grazing was had from a plat burned every third year than from annually burned plats. Early January burning of a plat covered by three seasons' accumulation of dead litter very effectively killed out all the rooigras as well as some associated species, whereas on an adjoining plat with little dead litter burned similarly the rooigras was not killed quite so effectively. Midsummer burning did not destroy perennial pioneer grasses such as *Aristida junciformis* and some associated climax grasses, viz, *Axonopus semialatus ecklonii* and *Tristachya leucothrix*. Winter burning seemed to favor early development of weeds, largely legumes. Most of the weeds are of considerable grazing value to sheep and horses but are not readily eaten by cattle. It was observed that where much dead grass accumulates rooigras tends to be rapidly replaced by *Trachypogon plumosus*, and if vegetation is kept reasonably short by mowing and light grazing and no burning practiced an association of *A. semialatus ecklonii*, *Andropogon filifolius*, and *Microchloa caffra* becomes dominant in place of the rooigras. Rooigras unburned for three years seemed to lose its vigorous growth and ability to produce seed.

Inoculation of legumes, P. E. Brown and L. W. Erdman (*Iowa Sta. Circ. 102 (1927), pp. 8*).—The practical information given tells why, when, and how legumes should be inoculated.

Legume inoculation, A. G. Lochhead (*Canada Dept. Agr. Pamphlet 81, n. ser. (1927), pp. 13, figs. 6*).—Varieties of legume bacteria, inoculation methods, and conditions affecting success of inoculation are discussed, with examples of gains due to inoculation on different Canadian experimental farms. As in the publication above, the use of culture for inoculation of nonlegumes is not advised at present.

Morphological similarities in alfalfa strains, G. P. McRostie, R. I. Hamilton, and N. O. Lundblad (*Sci. Agr., 7 (1926), No. 4, pp. 136–141, figs. 7*).—Mor-

phological characters, found constant enough to be used in describing alfalfa strains studied at the Central Experimental Farm at Ottawa, included the general plant attitude, general color of the main stem and leaves, size and shape of leaf, stipules, flower color, and density of head as indicated by number of flowers per unit length of rachis or peduncle. A descriptive table indicates the use of these characters in differentiating strains.

The influence of lime on alfalfa, J. G. LIPMAN and A. W. BLAIR (*New Jersey Stas. Rpt. 1925, pp. 289–294*).—Data are recorded for the years 1917, 1918, and 1922, supplementing earlier work (E. S. R., 39, p. 738).

The total hay yields and total dry matter and nitrogen in the alfalfa hay rose with an increase in the lime application of from 0.5 to 2 tons per acre. With one exception, the nitrogen percentage was higher in hay from the second cutting than in hay from the first or third cutting, and higher in hay from limed than from unlimed plats. Increases of nonlegumes on the same plats were not so great as for alfalfa, the former giving their maximum yields with the 1-ton application. The percentage of nitrogen in the dry matter of the nonlegumes was not altered much by liming.

Planting beets for seed, D. A. PACK (*Facts About Sugar, 21 (1926), No. 46, p. 1094*).—The method outlined for planting mother sugar beets is said to have been highly successful during several years. After making a suitable hole the beet is held in position and the soil replaced to the level of the first leaf scars. This soil is puddled with water and brought into immediate contact with the root surface by a slight movement of the beet, or by settling with the spade. The remainder of the soil is placed firmly about the beet and 0.5 in. of loose soil placed over the beet crown. "These results have led to a marked certainty in the control of unfruitful beets, so long as one is dealing with healthy, properly stored, and early planted seed beets."

Russian cultivated clover [trans. title], P. I. LISITSYN (LISSITZYN) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 15 (1925), No. 4, pp. 208, figs. 9; Eng. abs., pp. 194–207*).—An historical account of red clover in Russia is supplemented by studies of plant characters in relation to cold resistance and maturity and of the characteristics of types of *Trifolium pratense*, all detailed in an English summary (pp. 194–207).

The number of developed internodes (0.5 cm. and longer), branches of the stem, and the length, weight, and number of stems generally increased from early populations and races (as indicated by the period of blooming) to late ones, whereas the reverse was observed in the percentage of leaves and the weight percentage of flowers in the total weight of stems. Similar decreases were observed in the hay in the percentages of ash, total nitrogen, and protein, whereas fat and nitrogen-free extract did not vary and fiber increased. Winter resistance seemed to be related to the blooming period and not to the depth penetrated by the root column. The late populations are indicated as hardy and early ones as tender.

Development of flowers and bolls of Pima and Acala cotton in relation to branching, H. F. LOOMIS (*U. S. Dept. Agr. Bul. 1365 (1927), pp. 28, fig. 1*).—This investigation, which continued the study of fruiting parts of cotton made by Martin, Ballard, and Simpson (E. S. R., 50, p. 30), was carried on at Sacaton, Ariz., during 1924 and 1925.

More floral buds or squares were produced by the Acala plants in each season than by Pima plants. Acala shed a higher percentage of squares and developed a much smaller percentage of squares into bolls. The mean age of shedding after appearance of squares was slightly earlier in Pima than

in Acala, but more Acala squares shed when well advanced in age, and th period of liability for a square to shed was longer in Acala.

Among squares of the same date those on outer nodes of fruiting branche of both varieties required longer to develop into flowers than those on inne nodes. The periods on all of the nodes lengthened as the season progressed The mean square period for Pima was slightly over 33 days in both years and for Acala the period was 28 in 1924 and 29 in 1925.

On specific nodes of fruiting branches of both varieties the percentage o square shedding increased and the percentage of squares developing into boll decreased toward the branch ends. Branches of one node only, both on mai stalks and on vegetative limbs of both varieties, had a higher percentage o squares shed and fewer squares developing to mature bolls than on node of longer fruiting branches. The last or outer node of all fruiting branche of two or more nodes on main stalks and vegetative limbs of each variety shed a larger proportion of squares and developed fewer to mature bolls. Bol shedding from specific nodes increased appreciably in both sorts on the oute nodes of fruiting branches.

Pima and Acala squares were shed in shorter periods in the early part o the season than in the later. The position of a square on a fruiting branch of Pima did not materially hasten or retard the shedding of that square whereas squares shed from the outer nodes of Acala branches were usually somewhat older than those which fell from inner nodes. The maturation period of bolls of the same flowering date was longer on outer than on inner nodes of fruiting branches of both varieties. Boll periods on all nodes lengthened as the season progressed, averaging about 58 days on Pima and 53 days on Acala in 1924 and about 62 and 57, respectively, in 1925. The boll period on node 2 apparently was lengthened by the presence of a boll on node 1.

Variation in certain lint characters in a cotton plant and its progeny, E. P. Humbert and J. S. Mogford (*Texas Sta. Bul. 349 (1927), pp. 23, figs. 4*).—The variation in the length of lint in an inbred plant of Mebane cotton and its progeny and the variability in the lint percentage in the progeny were investigated during two years at the station. The lint length was found to vary in different bolls on the same plant, in the same boll, and on seed side by side in the same lock, these variations existing in both parent and progeny. Lint percentage did not vary to such an extent as the lint length. Under the particular growing conditions no correlation was apparent in the lint length between individual seeds of the parent plant and their progeny. The mean lint length of the progeny, however, approached closely to that of the parent. Since the results reported indicate that for the purpose of selection no consistent difference exists in the lint length and the lint percentage between bolls taken from different parts of the plant and therefore bolls from all parts of the plant are equal in value for breeding purposes provided the seeds are viable, the average performance of the plant should be considered as a unit in making breeding selections.

Cotton experiments, 1926, South Mississippi Branch Experiment Station, E. B. Ferris (*Mississippi Sta. Circ. 69 (1926), pp. 7*).—Continued experiments with cotton (E. S. R., 56, p. 135) embraced tests with different fertilizer formulas, comparisons of sources of potassium and nitrogen and of factory v. home-mixed fertilizers, and varietal trials.

[**Flax production in Ireland in 1925**] (*Flax Supply Assoc. Ireland Ann. Rpt., 58 (1925), pp. 67*).—Statistics of the acreage, production, manufacture, and commercial movement of flax and flax products in Ireland and Great Britain in 1925 and previous years are supplemented with data relative to the flax, jute, and hemp industries throughout the world.

Standing power of oats (*Scot. Jour. Agr., 9 (1926), No. 4, pp. 399–401*).—According to observations at Craibstone, Scotland (E. S. R., 54, p. 434), lodging of oats seems to be caused by a very rapid period of growth, the incidence of which varies with the season, followed immediately by a rather heavy rainfall. Consequently a variety will be affected differently in different seasons, and its earliness, more than its inherent strength of straw, will determine its stability. Since in most seasons early varieties were found to stand better than later sorts, efforts to increase earliness should supplement other means for strengthening the straw.

Less lodging was observed in oats seeded early and sparsely and on plats sown with large, i. e., well-graded seed. Where the land was in poorer condition and the sod not so rich, complete fertilizers, probably because they made for earliness, surpassed incomplete mixtures in regard to resistance to lodging. Ammonium sulfate used in moderate quantities with phosphates and potassium was beneficial on meadow on the poorest lands. Phosphates or potassium, alone or in combination, had no marked beneficial effect on stability or earliness. The crop on limed plats was later and lodged worse than on unlimed plats. Salt appeared without effect. For very rich lands and turf abundant in wild white clover, practically precluding standing crops even under ordinary weather conditions, a potato or a root crop should precede the oats.

Effect of planting distances and time of shelling seed on peanut yields, J. H. BEATTIE, C. J. HUNN, F. E. MILLER, R. E. CURRIN, and E. D. KYZER (*U. S. Dept. Agr. Bul. 1478 (1927), pp. 12*).—In tests in cooperation with the South Carolina Experiment Station, peanuts spaced from 3 to 15 in. apart in 2.5- and 3-ft. rows made the highest 3-year average nut and hay yields around the 3-in. distances. Indications were that increased yields of peanuts and hay could be had through planting closer than the commercial practice.

Trials during 3 years with 7 varieties of peanuts shelled and stored under uniform conditions for from 1 to 5 months before planting showed that there is no consistent decrease in the germination of the seed or in the yield of peanuts obtained from seed shelled several months before planting time as compared with the germination and yield from seed shelled shortly before planting. Shelling some time before planting should be done carefully and the shelled seed stored in a dry, moderately cool place. Temperature and moisture conditions similar to those of a living room were found to be well adapted to the storage of shelled peanut seed.

Potato varieties, R. N. SALAMAN (*Cambridge, Eng.: Univ. Press, 1926, pp. XXIII+378, pls. 10, figs. 19*).—Largely from the viewpoint of the British Isles, this comprehensive volume defines a potato variety, traces the history of the development of modern varieties, outlines methods of producing new sorts, and describes the application of genetics, the technique of hybridization, and correlations between characters. The relation of yield to genetic and environmental factors is shown, and varietal differences are indicated as to maturity, productivity, chemical, physiological, and histological features, disease resistance, reaction to temperature, and adaptation to soils and climatic conditions.

Space is accorded to the merits of classification systems, and besides a determinative key are supplied descriptions, synonyms, and uses of numerous varieties. A chapter deals with the use of the leaf index. In an appended discussion W. H. Parker describes yield testing and the statistical treatment of results. The bibliography includes 177 titles.

The spacing of grain sorghums, J. B. SIEGLINGER (*Jour. Amer. Soc. Agron., 18 (1926), No. 6, p. 525*).—Data from spacing experiments at Woodward, Okla., covering 4 years show that sorghum varieties which sucker profusely, e. g., the

group including the milos, common feterita, shallu, and Sunrise kafir, produce similar yields of grain when the distance between plants in the row varies from 6 to 30 in. Varieties which produce few suckers, e. g., Spur feterita, the kaoliangs, and probably all the kafirs other than Sunrise, show progressive reductions in yield for every successive increase in the distance between plants from 6 or 12 in. up to 30 in.

Work with sugar-beets at the Tucumán Experiment Station, W. E. Cross (*Internatl. Sugar Jour., 28 (1926), No. 334, pp. 529–537*).—A short résumé is given concerning the work of the station with sugar beets (E. S. R., 55, p. 737), including the 1925–26 results on varieties and comment on the necessary modifications of a sugar-cane factory for sugar beets.

Sweet clover: Growing and handling the crop in Idaho, H. W. Hulbert (*Idaho Sta. Bul. 147 (1927), pp. 20, figs. 6*).—Cultural and field methods and management practices are suggested for growing sweet clover for hay, pasture, silage, seed, and soil improvement, as a honey plant, and in rotations. The merits of the important species are indicated, and the results of seeding and cutting tests are reported briefly.

Growing wheat and barley hybrids in winter by means of artificial light, J. B. Harrington (*Sci. Agr., 7 (1926), No. 4, pp. 125–130, figs. 3*).—Varieties of wheat and barley and hybrid material were winter grown in the greenhouse successfully at the University of Saskatchewan by supplementing daylight with artificial light. Oats varieties and hybrids produced very few seeds. The P_1, F_1, and F_2 generations of Marquillo×Marquis wheat were successively grown from seeding to maturity during the period May 10, 1925, to May 8, 1926.

In general the plants under artificial light headed earlier and grew taller than those receiving daylight only. Delay in the use of artificial light until the plants had considerable growth resulted in later heading, increased height, and larger seed yield. Dakold winter rye, field sown September 4, 1925, and placed in the greenhouse under artificial light on October 15, headed January 5, 1926, while that wintered in the field headed June 2, 1926. Kharkof winter wheat similarly treated headed January 5 in the greenhouse and June 20 in the nursery.

A study of dark, hard kernel and protein content of hard red spring wheat, C. E. Mangels (*Jour. Agr. Research [U. S.], 34 (1927), No. 2, pp. 157–166, figs. 6*).—Correlation studies were made at the North Dakota Experiment Station on the relationship between dark kernels in hard red spring wheat and protein content, data on the 1925 crop supplementing that of 1922, 1923, and 1924 already noted (E. S. R., 53, p. 838).

Frequency distributions indicated that in each of the four years much of the crop contained a high percentage of dark kernels and would grade in the highest subclasses. A lack of close relationship between dark kernels and protein content was indicated, and considerable seasonal variation was seen in this respect. Frequency distributions showed that total variation in protein content was almost as large in groups of samples with more than 75 or 85 per cent of dark kernels, respectively, as in all the samples. The greatest frequency fell in the same class in all groups, except in the 1922 crop, where it moved into the 75 and 85 per cent dark kernel groups. The mean for samples containing 85 and 75 per cent, respectively, of dark kernels slightly exceeded the mean for all samples excepting 1922, when a significant increase was noted. Kernel color is not deemed as accurate an index of protein content for the wheat buyer as actual protein test.

Report on seed analyses, 1925, E. M. Gress (*Penn. Dept. Agr. Bul. 415 (1925), pp. 20, figs. 3*).—Tables show the average germination and purity for 174 samples of agricultural seed collected during 1925.

The use of sulphuric acid against weeds and certain crop parasites, E. RABATÉ (*Internatl. Rev. Sci. and Pract. Agr.* [*Rome*], *n. ser.*, *4* (*1926*), *No. 3*, *pp. 535–545*, *pls. 2*).—A résumé of experiments and experience in the use of sulfuric acid solutions on weeds in cereals, flax, and meadows, with notes on the effects on the soils and crops and the details of the method. Sulfuric acid solutions seem to have also a value in the control of foot rot of wheat and certain insects and diseases of vines and fruit trees.

Manual of weed seeds [trans. title], A. I. MAL'TSEV (MALZEW) (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *1925*, *Sup. 25*, *pp. 141*, *figs. 52*; *Eng. abs.*, *p. 141*).—The first part of a manual on weed seeds gives a general discussion of the reproductive organs of weed plants, with detailed descriptions of the seeds and fruits of weeds and comment on factors involved in their dissemination and germination. A subsequent part will detail the characteristics of the seeds and fruits of the principal weeds of European Russia.

HORTICULTURE

[**Horticultural investigations at the New Jersey Stations**] (*New Jersey Stas. Rpt. 1925*, *pp. 87–113*, *124–141*, *145–148*, *151–172*, *figs. 3*).—In the same manner as in the preceding report (E. S. R., 55, p. 37) herein are presented the results of experimental activities.

Extensive peach breeding operations conducted by C. H. Connors included the covering of entire trees of J. H. Hale, Chinese Cling, Iron Mountain, and others with tents, making possible a large number of pollinations. Various species and recent introductions were used as pollen parents. Further examination of J. H. Hale blossoms revealed no viable pollen, yet the setting of a few fruits on covered limbs is believed to indicate a slight tendency to self-fertility in this variety. New accessions to the already extensive peach collection are reported by M. A. Blake. Progress in the naming, propagation, and distribution of desirable peach seedlings is reported by A. J. Farley. Tables showing the blooming dates of peaches and the dimensions of typical fruits of many varieties are presented by Blake, who also comments upon the effect of the weather upon vegetative growth, set of fruit, and formation of fruit buds.

Carnation breeding conducted by Connors has resulted in a very promising scarlet variety designated as Rutgers. Among fertilizers tested for the dahlia, a 2–8–6 mixture used at the rate of 1,000 lbs. per acre gave favorable results. Although sulfur applied at the rate of from 100 to 200 lbs. per acre caused the production of blue flowers in hydrangea, the difficulty in mixing precludes its general use. A satisfactory percolator was devised for growing hydrangeas in pure cultures. Phenological data are presented by Blake for various ornamental and fruit plants.

A comparison by Farley of spraying and dusting as means of controlling insect and fungus pests in an apple orchard near Red Bank led to the conclusion that both treatments are equally effective from a commercial viewpoint. Dusting was less costly than spraying and is on the whole considered as an excellent auxiliary but not a satisfactory substitute for spraying.

Investigations by J. H. Clark on Concord and Brighton vines indicated that renewal canes developing from adventitious buds are about as productive as those which arise from the nodes of wood a year older than the cane. In respect to the effect of the original cane length upon yield, it was found that in Concord and Brighton medium-length canes were more productive than were

longer or shorter ones. Preliminary results obtained in 1924 showed the yield of canes to be approximately proportional to the number of buds left at pruning. Variety tests with native and vinifera grapes are reported.

Experiments with runner plants of Howard 17 and Joe strawberries showed favorable results from spacing in the case of Howard 17, a variety in which practically all runner plants in the spaced plat were productive, and negative results in the case of Joe, a variety with many unfruitful runner plants. Meritorious new fruits are described, and blooming dates given for apples and peaches at various points in New Jersey.

The results of fertilizer studies with tomatoes, carrots, celery, asparagus, and cantaloupes, are reported in detail by L. G. Schermerhorn and H. F. Huber. Cantaloupes started in veneer bands under glass reached maturity two weeks ahead of field-sown seed. Data are also presented upon the effect of nitrate of soda upon peppers, sweet corn, and tomatoes. As reported by Huber, the Virginia Savoy spinach was more resistant to mosaic and adverse winter weather than any other commercial variety. Of nine varieties sown in August the Giant Thick Leaf was most productive. Results of fertilizer tests with fall spinach indicated the advisability of applying all of the fertilizer before planting and using a high nitrogen mixture. Studies with spring cauliflower showed the value of supplementing manure with commercial fertilizer and the advisability of applying supplemental fertilizer during the growth period. Similar results were secured with lettuce. Of various forms of nitrogen tested for lettuce, nitrate of soda used alone gave inferior results, but when combined with blood or fish meal as a mixed fertilizer gave excellent yields. Bone meal alone and nitrogen alone gave unfavorable results.

[Paper mulch studies with vegetables], R. Mutzek (*Gartenwelt, 30 (1926), No. 52, pp. 814–816, figs. 2*).—Records taken in an experimental garden near Dresden, Germany, upon the growth and productivity of tomatoes, lettuce, and beans mulched with paper and upon comparable checks showed a much more rapid and greater development in the paper mulched plats, more than sufficient to offset the cost.

The quality of vegetable seed sold in packets in Connecticut, E. M. Stoddard and A. D. McDonnell (*Connecticut State Sta. Bul. 283 (1927), pp. 99–110, fig. 1*).—This comprises tabulated data upon the results of germination tests of vegetable seeds purchased in the open markets in 1925 and 1926. No discussion is presented.

Okra, J. G. Woodroof et al. (*Georgia Sta. Bul. 145 (1927), pp. 164–185, figs. 8*).—Following a brief description of the plant and flower, general information is offered upon cultural requirements, harvesting, yields, varieties, utilization, and the control of pests. The results of analyses made by the department of chemistry of edible pods of four varieties are included.

Observations upon the germination of okra seed indicated the advisability of soaking for about 48 hours prior to planting. None of several chemicals used for treating seed, including bichloride of mercury, Bordeaux mixture, copper carbonate, and various organic mercury compounds, was superior to water, nor did any of the chemicals cause injury, even though the treatment was continued for 24 hours. Freezing in a moist environment for 3 hours did not materially affect germination.

A section devoted to experiments in feeding okra to dairy cows is noted on page 73.

Onion growing in Utah, A. L. Wilson (*Utah Sta. Circ. 64 (1927), pp. 32, figs. 8*).—Herein is presented general information upon the onion-growing industry in Utah from the viewpoint of market onions and also the production

of seed. Data on a thinning test showed reduced yields and decreased returns per acre from this treatment. Of several varieties tested, the Riverside Sweet Spanish proved superior in yield and grade but was inconsistent in keeping quality, being high for two seasons and low the third. Fall-planted mother bulbs yielded much more seed per bulb but suffered severely from winter losses. Wounding the mother bulbs prior to planting materially increased the output of seed.

Growth of tomato cuttings in relation to stored carbohydrate and nitrogenous compounds, M. E. REID (*Amer. Jour. Bot.*, *13* (*1926*), *No. 9*, *pp. 548–574*, *pls. 2*).—That the growth response of plants is a direct expression of a measurable qualitative and quantitative condition of food materials within the plant was indicated in studies with tomato cuttings taken from plants in widely different vegetative conditions. In all lots receiving similar treatment those individuals which had the greatest original weight produced the largest total growth of roots or shoots or both. The character of the growth response to nutrients depended upon the nature of materials within the cutting. A high nitrogen supply plus a readily available supply of carbohydrates appeared to furnish a favorable condition for shoot growth, and a limited nitrogen supply plus a relatively large content of readily available carbohydrates seemed an ideal state for root growth.

A more complete utilization of carbohydrate reserves occurred when high-carbohydrate cuttings were grown in the light than when they were grown in darkness. The utilization of carbohydrates appeared more rapid in solutions with nitrates than without. With reserve carbohydrates present, synthesis of nitrogenous materials occurred in cuttings grown in solutions containing nitrates both in light and in darkness. However, in darkness growth ceased and death resulted within a few weeks despite available carbohydrates, indicating that light in some way was essential to the synthesis of certain necessary substances. Shoots were produced more abundantly in light than in darkness. Large and small amounts of young tissue in cuttings were favorable in light and darkness, respectively, to the production of shoots. The ability of cuttings from different levels of the stem to produce roots and shoots varied with the composition of the cutting and the external conditions under which it was grown.

Effect of phosphorus on the composition of the tomato plant, J. H. MACGILLIVRAY (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 2*, *pp. 97–127*, *figs. 6*).—A study of Bonny Best tomato plants grown in sand cultures with and without phosporus showed this element to be highly essential in the nutrition of the tomato. Plants without phosphorus had a starved appearance much like those lacking in nitrogen. They dropped their lower leaves early, the foliage was small and yellow, and the roots were much shorter and darker colored than those of ample phosphorus plants.

Determinations of the percentage of phosphorus in both groups showed an almost steady increase from the bottom to the top regions of the stem in the ample phosphorus plants, while in the nonphosphorus group approximately the same percentage was found from the bottom up to the active growing region at the top. Apparently high percentages of phosphorus are associated with regions of rapid growth, and since these regions developed after the initiation of the differential treatments, the author suggests that phosphorus is apparently subject to reutilization in the case of starved plants. The slow recovery of plants resupplied with phosphorus indicates a slow phosphorus movement as compared with that of nitrogen.

Irrespective of treatment, approximately one-half of the total phosphorus in the plants was located in the fruits, and although the fruits of nonphosphorus

plants were small and contained fewer and smaller seeds, these seeds were capable of growth. The presence of a larger total quantity of phosphorus in the fruit pulp than in the seeds indicates that phosphorus is essential to the formation of both.

The embryonic regions, that is, fruit, cluster stems, top leaves, and top stems were not only higher in percentage of phosphorus but also percentage of nitrogen. Nitrogen, however, reached its maximum in the top leaves rather than in the fruit and cluster stems. The association of high nitrogen and phosphorus is explained by the occurrence of proteins in the embryonic tissue. Phosphorus starvation increased the percentage of sugars in the plant, apparently at the expense of the starches. The percentage dry weight of the starved plants was also markedly increased, probably by the deposition of cellulose and lignin as well as the formation of sugars.

Preliminary report on the growing and marketing of fresh tomatoes in New Mexico, A. B. FITE (*New Mexico Sta. Bul. 157 (1927), pp. 18, figs. 3*).—Information of a popular nature is offered on tomato culture, taking into special consideration harvesting and marketing with a view to aiding prospective growers about to engage in the production of this vegetable for shipment. Figures presented for one successful enterprise show a net return per acre of over $132.

Transplanting fruit trees, T. J. TALBERT (*Missouri Sta. Bul. 245 (1927), pp. 16, figs. 4*).—This publication, a digest and popular revision of Research Bulletin 33, by Whitten (E. S. R., 43, p. 141), contains general information on transplanting practices with various fruit and ornamental trees, supplemented by brief discussions of the principles involved. The comparative merits of autumn and spring planting are discussed, and suggestions are given upon the pruning of tops and roots at the time of transplanting.

An investigation of root activity of apple and filberts, especially during the winter months, G. H. HARRIS (*Sci. Agr., 7 (1926), No. 3, pp. 92–99, figs. 6*).—Observations upon the root development of apple and filbert trees showed that in a mild climate, such as obtains at the Oregon Agricultural College, roots continue to grow throughout the entire year unless subject to continued submergence, freezing, or excessive drought. In naturally well-drained soils submergence for brief periods did little harm. Observations upon the growth of the roots of apple trees in sandy soil indicated that the original root system functions chiefly as a foundation for new roots, which in sandy soil are distributed all over the original root and in heavy clayey types are largely restricted to the region of the tree collar. Filbert roots were found less resistant to water shortage and more resistant to excess water than were those of the apple. Laboratory studies with apples showed that young trees can be maintained successfully in nutrient solutions provided the solution is changed every three or four days or an auxiliary supply of air furnished, suggesting that submergence injuries to roots are caused by a deficiency of oxygen or an accumulation of carbon dioxide rather than direct water injury.

General survey of fruit pollination studies and investigation in the United States, M. J. DORSEY (*Kans. State Hort. Soc. Bien. Rpt., 38 (1924–25), pp. 27–30*).—A concise presentation of the status of knowledge of the effect of various genetic and physiological factors in limiting the fruitfulness of apples, pears, and other trees.

[Spray calendars for New Jersey fruits] (*New Jersey Stas. Circs. 201 (1927), pp. 4, figs. 2; 202, pp. 4, figs. 3*).—These circulars presenting spray schedules for the apple and quince and the peach are designed to supersede earlier noted pamphlets (E. S. R., 55, p. 38).

A progress report on the removal of spray residue from apples and pears, R. H. ROBINSON and H. HARTMAN (*Oregon Sta. Bul. 226 (1927), pp. 46, figs. 5*).—As outlined in a brief popular report (E. S. R., 56, p. 441), investigations with a considerable number of chemicals as possible media for the removal of spray residues have shown hydrochloric acid to be the most effective of all materials tested, both in respect to the removal of the residues and the effect upon the keeping quality. Used at concentrations varying between 0.25 and 2 per cent actual acid, this chemical not only removed arsenicals but also lead, copper, and lime compounds. Where fruits were rinsed freely with clear water following the acid treatment no chemical was needed to neutralize the acid. Sodium hydroxide was also effective in removing arsenicals but not in removing copper and lime materials; furthermore, the use of sodium hydroxide resulted in more or less injury to storage quality. The use of oil sprays in connection with arsenates apparently retarded the action of the solvents but did not render cleansing impossible provided sufficient time elapsed between spraying and washing. The use of spreaders apparently did not interfere materially with the cleansing process.

Preliminary observations showed no harm from packing slightly moist fruits, especially if reasonably free from decay and treated shortly after picking. Mechanical cleaners failed to cleanse fruit as thoroughly as chemicals and also caused slight injuries which materially diminished keeping quality.

Is the ringing of fruit trees a commercial practice? J. H. GOURLEY (*Ohio State Hort. Soc. Proc., 58 (1925), pp. 91–100*).—Following a discussion of the technique of ringing fruit trees, the author reports on certain results obtained at the Ohio Experiment Station. Varieties naturally slow in coming into bearing, such as Sutton Beauty, Liveland Raspberry, Northern Spy, Mammoth Black Twig, and Greenville made but little response to ringing. In some trees a marked response was obtained two years in succession, although there was in no instance any record of individual spurs repeating actual fruit bearing the second season. In the case of 10-year-old Winesap trees standing in sod without fertilizer or mulch, the ringing of either the trunk or main limbs resulted the following season in full bloom, while normal branches or trees carried only a light bloom. The application of nitrate of soda aided ringed trees in recovering from the weakening effects of the ringing treatment. Observations made in a commercial orchard consisting of 18-year-old trees showed 75 per cent of bloom on ringed trees, as compared with 43.4 on controls. Nitrogenous fertilizers applied just prior to ringing had no effect on fruit setting.

In conclusion, the author points out the special significance of ringing as a means of hastening fruit production in filler trees.

Factors affecting the setting of fruit, F. S. HOWLETT (*Ohio State Hort. Soc. Proc., 58 (1925), pp. 80–87*).—Investigations conducted by the Ohio Experiment Station in Washington, Geauga, and Wayne Counties show that most of the important Ohio varieties of apples are fully or practically self-sterile. Tabulated records show that Delicious, Grimes, Jonathan, Rome, and Wealthy are good and Baldwin and Stayman Winesap decidedly poor pollinizers for other varieties.

Varieties and locations as factors in apple production, V. R. GARDNER (*Michigan Sta. Spec. Bul. 161 (1927), pp. 45, fig. 1*).—A report upon the apple variety situation in Michigan based upon data obtained in 100 commercial orchards and from cooperative fruit exchanges and private selling agencies.

Of a total of 130 varieties of bearing age, only 16 contained 2 or more per cent of the total number of trees. Ranked in descending order the first 10 were Duchess, Jonathan, Baldwin, Wagener, Wealthy, Northern Spy, Stark, Rhode

Island Greening, Grimes, and Hubbardston. In nonbearing orchards the leading 10 varieties were Jonathan, McIntosh, Northern Spy, Delicious, Grimes, Wagener, Wealthy, Canada Red, Duchess, and Snow, thus showing a tendency for some of the newer varieties to replace the old.

Arranged in descending order according to average market value of the A-grade fruit during the 1921–1925 period the leaders were Delicious, Yellow Transparent, Bough, Jonathan, Northern Spy, Canada Red, McIntosh, Golden Sweet, King, and Snow. Grading data taken on 75 varieties show McIntosh, Rhode Island Greening, Jonathan, King, Snow, and Canada Red to be among those which brought both good prices and graded out well to first class fruit. In respect to tree run values Delicious led followed by Yellow Transparent, Bough, Jonathan, McIntosh, Golden Sweet, Rhode Island Greening, King, and Snow. Average yields of varieties grouped according to the age of the tree show Snow to have been a particularly fruitful variety. Other superior croppers include Northern Spy, Grimes, Rhode Island Greening, Ben Davis, Stark, Hubbardston, Jonathan, and Baldwin.

There follows a general discussion of the commercial value of various individual varieties and of the influence which personal management and efficiency, the nature of the soil, and the location of the orchard play in determining yields, quality, and profit. Sites, soil, grades, variety, and price in the order given are deemed the most important factors in apple production.

Why a cull apple is a cull, H. P. Gaston (*Michigan Sta. Spec. Bul. 160 (1927), pp. 42, figs. 33*).—An analysis of detailed observations taken on the apples received by the Fennville fruit exchange from 24 representative growers and of data obtained in other exchanges show that in the average year the average Michigan apple grower produces 56.5 per cent of A grade, 28.1 per cent of B grade, and 15.4 per cent of cull fruit. An average of 4 years' grading records on 10 varieties showed marked varietal differences. In respect to A grade, Baldwin was lowest with 38 per cent and McIntosh highest with 76.3 per cent, a situation partly explained by the younger age of the McIntosh trees.

Listed in descending order of importance, small size, limb rub, handling bruises, stings, and scab were the most common causes of low-grade fruit. The factors promoting cull fruit differed in importance according to variety; for example, small size was common in Baldwin, limb rub was serious in Rhode Island, and handling bruises prevalent in Northern Spy. Although better spraying, pruning, and soil management, together with thinning the fruit, would result in more A grade apples, nevertheless certain conditions such as poor location, inferior soil, and old trees would prevent equality in all orchards irrespective of treatment.

Cider apples, G. Warcollier (*Le Pommier à Cidre. Paris: J.-B. Baillière & Sons, 1926, 3. ed., pp. 436, figs. 86*).—A small but comprehensive handbook discussing the various details of cider apple production, including propagation, planting, varieties, general culture, care, and pests. An experiment is briefly reviewed (pp. 203–206) in which weakened pear trees were restored to a thrifty condition by supplying nutrients through a perforation in the trunk. This work is along the lines suggested by Gourley (E. S. R., 50, p. 834).

The plum tree in northern Manchuria [trans. title], B. V. Skvortsov [Skvortzow] (*Obshch. Izuch. Man'chzhursk. Kraia Otd. Izd. (Manchuria Research Soc. Misc. Papers), Ser. A, No. 7 (1925), pp. 16, figs. 11; Eng. abs., p. 16*).—A study of plum trees growing in a semiwild condition in northern Manchuria led to the conclusion that these trees belong to *Prunus triflora* (*salicina*) rather than to *P. communis*, as suggested by earlier botanists.

Report of the Cranberry Substation, C. S. Beckwith and B. F. Driggers (*New Jersey Stas. Rpt. 1925, pp. 414–418, 419–421*).—Further data (E. S. R., 55, p. 39) taken upon nitrogen experiments with cranberries again showed that while nitrate of soda and dried blood are both favorable sources of nitrogen, the former is somewhat more effective. In the case of mixed fertilizer composed of 140 lbs. of nitrate of soda, 300 lbs. of rock phosphate, and 50 lbs. of sulfate of potash applied, with one exception, for six successive years, applications of 792 lbs. per acre were more effective than either smaller or larger amounts. Observations upon the residual effect of fertilizers upon muck land cranberries showed deleterious effects upon yield, even five years after application. In this case fertilizers apparently stimulated an over-excessive growth to the detriment of fruit production. A comparison of sprays and dusts on a cranberry bog at Hammonton gave inconclusive results, due to a disastrous hail storm. A test of proprietary weed killers showed that such materials must be used with great caution, for if applied in July or August they kill the plants.

Data taken in a study of the effect of holding the water table at various levels showed considerably fewer decayed berries and higher yields as the table was lowered. Favorable results in respect to fruit decay were obtained in bogs in which the water table was held high until the blossoming period and then lowered, thus indicating that the commercial practice of holding water high to prevent spring frost injury is not dangerous.

The cranberry in Oregon, W. S. Brown (*Oregon Sta. Bul. 225 (1927), pp. 31, figs. 20*).—This paper, including articles on Insect Control, reviewed by D. C. Mote, and on Cranberry Diseases, reviewed by H. P. Barss, presents general information on the cranberry industry of Oregon, taking into consideration among other things the location and preparation of the bog, care of the bog, irrigation, fertilization, harvesting, and marketing.

Yields of cacao on experiment stations, G. G. Auchinleck and C. H. Knowles (*Gold Coast Dept. Agr. Bul. 4 (1926), pp. 44, pl. 1*).—Information of a statistical nature is presented upon varieties, yields, seasons of production, annual fluctuations in yield, variations in size of pods, and the length of vigorous life of the cacao, the principal crop of the Gold Coast.

Citrus growing in South Africa, R. A. Davis (*Cape Town: Specialty Press of So. Africa, 1924, pp. 309, pl. 1, figs. 149*).—A general discussion.

Culture of the oriental persimmon in California, K. Ryerson (*California Sta. Bul. 416 (1927), pp. 63, figs. 20*).—General information is presented upon the development of the persimmon growing industry in California, botanical characters of the tree and fruit, chemical composition of the fruit, varieties, climatic and soil requirements, propagation, orchard management, harvesting, storing, etc.

A garden of herbs, E. S. Rohde (*London: Herbert Jenkins, 1926, rev. and enl. ed., pp. XV+300, pls. 9*).—Information gleaned from practical experience and from various old herbals is offered on the culture, characteristics, and uses of a large number of common and rare herbs.

Roses, J. C. C. Price (*Mississippi Sta. Circ. 70 (1927), pp. 9, fig. 1*).—Popular information is presented upon varieties, culture, pruning, and spraying.

FORESTRY

Handbook of forestry, I, T. Lorey, rev. by K. Eckstein et al., edited by H. Weber (*Handbuch der Forstwissenschaft. Tübingen: H. Laupp'schen Buchhandl., 1926, 4. ed., rev. and enl., vol. 1, pp. XIV+916, pls. 28, figs. 200*).—This, the first volume of a revised and enlarged edition, treats of scientific forestry and forest management, and forest ecology, zoology, and botany.

Our trees and how they serve us, R. S. Maddox and A. E. Parkins (*New York: Charles Scribner's Sons, 1925, pp. VII+180, pl. 1, figs. 72*).—This small handbook contains popular information upon trees, their habits of growth and uses, and the forest organization of the Nation and the States.

The trees of extra-tropical Australia: A reconnaissance of the forest trees of Australia from the point of view of their cultivation in South Africa, C. C. Robertson (*Capt Town: Govt., 1926, pp. IV+265, pls. 39*).—A survey, based on a report of a tour in Australia in 1924, of the forest trees of Australia which are deemed of possible value for cultivation in South Africa.

The theory of forest types [trans. title], A. K. Cajander (*Acta Forest. Fennica, 29 (1925-26), pp. [3]+84; Eng. trans., pp. [3]+108*).—A study of the forest flora on the main Finnish types, namely, (1) dry moss and lichen, (2) moist moss, and (3) grass-herb forests, leads to the conclusion that each has a characteristic vegetation which is only temporarily altered by disturbing influences such as fire, cultivation, and grazing. The quality of a given site is deemed to be roughly determined by the sum of climatic and soil factors. Nitrogen and calcium contents of the soil are distinctive in the several types. Climate is considered the most universal local factor. Within the range of similar climate, irrespective of geographical location, the same species of trees may be grown, suggesting that forestry throughout the entire world may be placed upon a common foundation.

The effect of fire upon forest vegetation in north Finland [trans. title], V. Kujala (*Commun. Inst. Quaest. Forest. Finland, No. 10 (1926), pp. 41, pls. 2, figs. 11*).—This article is in German.

On burned-over areas there were found three distinct groups of plants—(1) those which reproduced from underground root sprouts which survived fire injury, (2) those without such root stocks but dependent upon seeds in the soil or brought in by the wind, and (3) half-way forms between the other two. In the main, the principal types of vegetation were little changed by fire. However, the severity of the fires affected the character of regeneration, giving it a spotty character which often persisted into the mature forest. Very hot fires localized about fallen trees or brush often destroyed the underground sprouts and buried seeds, resulting in a predominance of species whose seeds are wind borne. Conversely, light fires resulted in an unusual proportion of root sprout species. Bog or marsh fires were much more destructive to the prevailing types of vegetation, usually resulting in the introduction of a temporary flora which is gradually replaced by the climax type.

Influence of precipitation cycles on forestry, R. Marshall (*Jour. Forestry, 25 (1927), No. 4, pp. 415–429, figs. 3*).—Analyses of tree growth, as determined by measurements of the growth rings in five age classes, namely, 280, 230, 180, 140, and 75 years, in western white pine located in the Kaniksu National Forest showed that in northern Idaho there has occurred rather distinct wet and dry periods varying in length from 20 to 40 or more years. Apparently the last two decades have been the driest 20 years during the past 250-year period. The author points out that foresters should take into consideration the part that variable precipitation plays in forest practice.

Seed germination in the gray birch, Betula populifolia, F. Weiss (*Amer. Jour. Bot., 13 (1926), No. 10, pp. 737–742*).—Studies upon gray birch (*B. populifolia*) seeds collected at Freeland, Pa., in 1925 showed distinctly higher percentages of germination in those seeds after-ripened in moist granulated peat for about two months at low temperatures than in ordinary air dried material. The treatment of seed with a mercury disinfectant further increased germina-

tion. No significant differences were recorded between the three storage temperatures utilized, namely, 32, 41, and 50° F. Seeds which had been afterripened germinated freely at lower temperatures than did dry stored seeds.

DISEASES OF PLANTS

Report of the department of plant pathology, W. H. Martin et al. (*New Jersey Stas. Rpt. 1925, pp. 443–507, figs. 10*).—Notes are given on the incidence, prevalence, distribution, and importance of plant diseases during the summer of 1924.

Oat smut control studies, W. H. Martin (pp. 457–460).—The use of the formaldehyde dip method considerably reduced the oat germination percentage. Germination percentage of the seed disinfected in blotters was reduced also with Uspulun and Semesan, though these disinfectants showed no reduction of germination when the tests were made in sand. Formaldehyde led as regards effectiveness, but it reduced yields. With this exception the treatments did not materially affect yield. This is supposedly due to the fact that only 4.05 per cent of the heads were smutted on the untreated plats.

Potato scab control studies in 1924, W. H. Martin (pp. 460–464).—In addition to the investigation of sulfur for the control of the disease, studies were also conducted to determine the influence of different nitrogen sources on the development of scab, the relation of different varieties to scab, and the value of the organic mercury dusts for disinfecting seed potatoes. The results of various tests, discussed briefly here, are to be presented more in detail in bulletin form.

Potato spraying in 1924, W. H. Martin (pp. 464–467).—In the spray tests indicated for this year, the only diseases observed were tipburn, hopperburn, and early blight. These diseases were controlled to a large extent with Bordeaux mixture and with copper-lime dust, and in all but one test the yields were increased as a result of spray treatments. However, a marked irregularity is pointed out. A summary of this work for the past 10 years has been reported from another source (E. S. R., 54, p. 747).

Studies on the root rot of peas (Pisum sativum) caused by Aphanomyces euteiches, C. M. Haenseler (pp. 467–484).—The symptoms are described of the pea root rot caused by *A. euteiches*. This disease was readily obtained by placing a zoospore suspension of the organism in contact with the base of the plant. Zoospores remain active and infective for 5 to 7 days. Peas are susceptible from germination probably to maturity, though the disease develops more slowly on older plants. Zoospores apparently do not migrate in the soil to any important extent, and there is little or no spread from plant to plant during the growing season. Root rot is favored by soil moisture up to saturation, the minimum lying near 30 per cent saturation. Canada field peas are as susceptible as the garden pea. Hairy vetch may act as host. Negative results were obtained in greenhouse and field from crimson, red, white, alsike, and sweet clover, alfalfa, kidney and soy beans, cowpeas, *Vicia faba*, and dent, pop, and flint corn. Pea root rot caused by *A. euteiches* was found in 16.5 per cent of 67 fields examined. Infection and subsequent development under field conditions are closely correlated with season, the greatest losses being associated with a wet warm soil during the infection period, followed by a period of extreme drought just prior to maturity.

Sweet potato disease investigations, R. F. Poole (pp. 484–507).—During two years a soft rot, "mottle necrosis," has caused severe losses, running as high as 60 per cent in some places. Studies as to the causation of this disease are in progress.

A storage disease producing a pickling effect, but no rot, has been reported from Swedesboro. The roots become brown, soften, and the tissues are watery. *Saccharomyces* sp. and bacteria were isolated, but neither reproduced the disease.

The stem rot control studies indicated no apparent tendency for Red Brazil, White Yam, and Triumph to become susceptible when subjected to a 3-year test on infected soils, but they produce larger and better tubers on some soils than others. Tests of important local strains along with other varieties indicate no sudden change in the relative resistance of the New Jersey strains. The number of plants killed by stem rot appears to be influenced by weather conditions during growth. The infections were more numerous when the hills contained two or three plants, but further tests are needed as to plants per hill and spacing. On infected soil, where infection is always heavy, it is considered advisable to plant between 9,680 and 14,520 plants per acre, rather than a smaller number, set at spacings 24 to 30 in. apart. A bulletin on cultural methods of control has been noted (E. S. R., 55, p. 449).

Scurf (*Monilochaetes infuscans*) was studied regarding sulfur as a control, soil moisture in relation to the disease, and the relation of harvest dates to the prevalence and severity of the disease on the potatoes. On fairly level and uniform sandy loams, with 300 lbs. sulfur per acre, healthy Yellow Jersey plants set June 1 and harvested in October showed yields nearly equal to those from the treated and control plats, whereas the 600-lb. sulfur treatment reduced yield by 50 bu. per acre. In another test, the 300-lb. sulfur treatment reduced the severely scurfed potatoes 37.4 per cent by number and 44.7 per cent by weight. Since it is shown that the disease spreads rapidly late in the season, it is thought advisable to harvest early the crops on the more severely infected areas.

In experiments to determine sulfur control on pox, it was found as a result of three years' application of sulfur that pox was decreased or eradicated through the use of from 400 to 600 lbs. per acre. The data obtained are considered to show that the best results with pox can be obtained by using small amounts of sulfur over a period of consecutive years, and it is not considered advisable to use over 300 lbs. of sulfur at any one application on account of sprout injury. Lime increases the severity of the attack. The disease is worse in dry seasons, the results indicating that it is important to preserve soil moisture, especially during June and July, the time of greatest pox injury.

The effect of nitrate of soda on the physiological cracking of sweet potatoes (which appeared to occur within a few days in October) was tested, partly in connection with the use of sulfur, and the data indicate that nitrate of soda and sulfur should not be employed together.

Plant diseases [Queensland], H. C. QUODLING (*Queensland Agr. Jour., 23 (1925), No. 1, pp. 31, 32*).—Maize head smut (*Sorosporium reilianum*) has increased, owing to lack of rotation. Alfalfa crown warts (*Urophlyctis alfalfae*) has appeared locally. Tomato wilt (*Fusarium* sp.) is minimized by the use of resistant varieties, which also appear to resist *Septoria* sp. Tobacco blue mold has become serious locally.

Sexuality and parasitism in the Mucorineae, I, H. BURGEFF (*Untersuchungen über Sexualität und Parasitismus bei Mucorineen, I. Jena: Gustav Fischer, 1924, pp. 135, pls. 4, figs. 43*).—A study of parasitism and sexuality and of their assumed relations is detailed as carried out with the Mucorineae.

The root parasitism of Western Australian Santalaceae, D. A. HERBERT (*Jour. Roy. Soc. West. Aust., 11 (1924–25), pp. 127–149, figs. 5*).—The seven Santalaceae examined, *Fusanus spicatus*, *F. acuminatus*, *Leptomeria preissiana*,

L. spinosa, *Choretrum lateriflorum*, *Exocarpus aphylla*, and *E. sparica* are all root parasites, differing, however, in mode of attack in ways which are described. The haustoria in all cases are lateral and appear to be distinct organs and not, as is sometimes the case with Krameria, modified root tips. The phloeotracheides in these species occur in bundles round an inner parachymatous core, and not in a continuous layer, as in *E. cupressiformis*, nor in two bundles as in Thesium.

Effect of carbon dioxide upon the germination of chlamydospores of Ustilago zeae (Beckm.) Ung, G. A. PLATZ, L. W. DURRELL, and M. F. HOWE (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 2*, *pp. 137–147*, *figs. 3*).—Experiments on the stimulatory effect of the presence of living plant tissue upon the germination of the chlamydospores of *U. zeae* are said to have indicated that a great variety of plant tissues affect the germination of the spores. Analysis of the stimulation caused by the presence of plant tissue shows that the stimulatory agent is carbon dioxide. Atmospheres containing 15 per cent of carbon dioxide produced by the presence of plant tissue or by a gas generator were found to be optimum to the germination of spores of *U. zeae*. When more than 15 per cent of carbon dioxide was used a retarding effect was noted. The stimulatory effect is considered to be due to a definite action of carbonic acid. Atmospheres containing 15 per cent of carbon dioxide produced H-ion concentrations in the spore culture media varying from 4.9 to 5.6, according to the medium used. The optimum acidity for germination obtained with carbonic acid is considered nearer pH 4.9 than 5.6.

Effect of smut (Ustilago zeae) on the sugar content of cornstalks, A. M. HURD-KARRER and H. HASSELBRING (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 2*, *pp. 191–195*).—It is stated that the growth of *U. zeae* on the stalks of corn results in a considerable reduction of sucrose in the diseased stalks, and an evident, though lesser, reduction of hexoses, the loss of sucrose being greatest in the most severely infected stalks.

The authors' data are said to show that the growth of *U. zeae* on cornstalks results in a large reduction of the sugar content of the tissues, and it is evident, therefore, that the fungus also depends on the carbohydrates of the host for a part of its nutriment.

The physics of spray liquids.—IV, The creaming capacity of emulsions: Paraffin solutions, R. M. WOODMAN (*Jour. Pomol. and Hort. Sci.*, *4* (*1925*), *No. 3–4*, *pp. 184–195*).—In continuation of papers previously noted (E. S. R., 53, p. 556), it is claimed to have been shown that "so-called emulsions tend to cream so as to give a clear aqueous underlayer and a cream containing approximately the mathematical limit (74 per cent) of disperse phase. It is argued that this cream is the only true emulsion, and that under ideal conditions it should contain the mathematical limit of disperse phase. Mixtures of this cream or emulsion with excess continuous phase are termed emulsion mixtures. The difference between the setability, and the stability to creaming, of an emulsion mixture is pointed out. In the first case, lack of stability should be judged to mean the 'cracking' of an emulsion into separate layers of disperse and continuous phases. In the second case (which is often confused with true stability) lack of stability results in creaming to the true emulsion (cracking into disperse phase in mass usually taking place after the formation of this cream). The creaming effect is probably one of the chief causes of failure of emulsion mixtures in spraying. The use of wide vessels as containers and the employment of dilute emulsion mixtures accentuate this defect. Equalization of densities of the disperse and continuous phases of an emulsion mixture by adding a substance of greater specific gravity than water, completely miscible

with the disperse phase and showing limited miscibility with the continuous phase, gives very stable or lasting emulsion mixtures in the case of paraffin oil. In some cases, actual solution of relatively large amounts of oil is obtained. The easiest methods of preparation of these solutions are discussed, and the probable use of the solutions as foliage sprays indicated."

The chemistry of bactericidal action by phenol [trans. title], K. SCHUBERT and K. RICHTER (*Centbl. Bakt.* [*etc.*], *2. Abt.*, *66* (*1926*), *No. 1-7, pp. 11-16*).—Data from this study are tabulated with discussion.

Injury to growing crops caused by the application of arsenical compounds to the soil, H. E. MORRIS and D. B. SWINGLE (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 1, pp. 59-78, figs. 6*).—In a previous publication (E. S. R., 25, p. 550) the authors described the effects of arsenical compounds on fruit trees. In the present paper an account is given of experiments on the effect on plant life of arsenical compounds when added to the soil.

Laboratory, greenhouse, and field tests were made of a number of species of plants when subjected to several arsenical compounds. It was found that with oats in water cultures arsenic added as arsenic trioxide decreased transpiration and the plants had narrower leaf blades and a lighter color. Decreased transpiration also resulted with tomatoes when arsenic trioxide was added to the soil at the rate of 10 parts per million or more, and this decrease was in direct proportion to the amount of arsenic added until serious injury or death resulted. Similar results were obtained with sodium arsenite and potassium arsenite. When sand was used instead of soil, the injury was apparent in a shorter time. The addition of small quantities of soluble arsenical compounds to potted plants caused serious injury to most of the plants under test. As a rule cereals were hardier than other crops, and turnips were also fairly resistant. The arsenites were decidedly more toxic than the arsenates. Some of the so-called insoluble arsenical compounds were found to be very toxic to plants when 2.5 gm. of the chemical was sprinkled evenly over the surface of the pot.

The authors conclude that the incorporation of arsenical compounds in the soil is a dangerous practice and may cause considerable injury as the concentration of arsenic increases. Plants differ in their ability to withstand arsenic, as some crops remain approximately normal when arsenic in some form is present, while other crops in the same environment are killed. Beans and cucumbers were found to be very susceptible to arsenic, but cereals and grasses were more resistant.

Germination tests with "shot" wheat: Effect of treatment for bunt, A. H. E. McDONALD and A. W. S. MOODIE (*Agr. Gaz. N. S. Wales. 36* (*1925*), *No. 6, pp. 414-416*).—Tests indicated in tabular form show losses arising in connection with grain which has been badly bleached or "shot," in connection with rain falling during the harvest and subsequent treatment for bunt. Germinability is greatly impaired when copper sulfate is used for the treatment, less so when copper carbonate is employed.

Downy mildew of wheat, R. J. NOBLE (*Agr. Gaz. N. S. Wales, 37* (*1926*), *No. 3, pp. 204-208, figs 4*).—The presence and effects of wheat downy mildew (*Sclerospora macrospora*) are noted, with accounts of this fungus as known elsewhere.

Frost blister of vegetables, W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 37* (*1926*), *No. 4, pp. 319-322, figs. 3*).—A disease of celery at Bathurst Experiment Farm is thought to be due possibly to frost, the same condition being found about the same time in celery, beet, broad bean, and rhubarb at Aylmerton.

A disease affecting lucerne, R. J. NOBLE (*Agr. Gaz. N. S. Wales, 36 (1925), No. 11, p. 827*).—Nematode (*Tylenchus dipsaci*) disease of alfalfa was recently recorded for the first time in New South Wales. The only control measures are preventive, consisting in omitting alfalfa from infected ground for three years.

Bean anthracnose (*Queensland Agr. Jour., 24 (1925), No. 2, pp. 163, 164*).—H. Tryon supplies somewhat generalized information in response to an inquiry reporting serious localized damage occasioned by bean anthracnose (*Colletotrichum lindemuthianum*).

Another fungus attacking cotton (Sclerotinia sp.), W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 35 (1924), No. 11, pp. 797, 798, figs. 2*).—A condition involving nonopening and decay of cotton bolls was associated with one or more each of *Fusarium* sp., *Rhizopus* sp., *Alternaria* sp., and *Sclerotinia* sp. (possibly *S. libertiana*), which is supposed to afford the first record of a Sclerotinia attacking the cotton plant.

Downy mildew of mangold and beet, E. S. SALMON and W. M. WARE (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 9, pp. 833–838, pl. 1, fig. 1*).—Mangolds showed in June, 1925, an outbreak of downy mildew (*Peronospora schachtii*) in east Kent which is described as to symptoms displayed and as to phases of the organism. Seed-bed soil or other transmission appears probable.

Control measures recommended on the basis of European experience require clean ground and seed, clearance as regards wild beet (*Beta maritima*), and spraying with Bordeaux mixture during the growing season.

A fungus and some of its host plants (Sclerotium rolfsii, Sacc.), W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 35 (1924), No. 6, pp. 441–444, figs. 6*).—An account is given of the so-called southern blight said to have caused about 10 per cent loss in potato, from 40 to 70 per cent loss in carnation, and losses not stated in a number of other economic plants named.

Leaf roll, mosaic, and related diseases of the potato, I, II (*Scot. Jour. Agr., 8 (1925), Nos. 1, pp. 44–55, pls. 3; 2, pp. 176–189, pls. 2*).—This historical and somewhat detailed though popular comparative account of leaf roll and related diseases emphasizes the necessity for coordination of the research work due to the obscurity still surrounding these virus diseases, their combinations, and their complications. A bibliography of 21 titles is furnished.

"Downy mildew" of rhubarb: Peronospora jaapiana, Magn., W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 36 (1925), No. 4, pp. 288–290, figs. 3*).—In the agricultural college garden, Richmond, and elsewhere, rhubarb showed a downy mildew condition which was constantly associated with a fungus. This fungus is described and is believed to be *P. jaapiana*.

Cane pests and diseases, W. COTTRELL-DORMER (*Queensland Agr. Jour., 23 (1925), No. 6, pp. 457–459*).—Studies, chiefly in the laboratory, of sugar cane in South Johnstone are noted as referring to leaf scald, leaf stripe, sclerotial disease, gumming disease, and root and leaf sheath diseases.

Investigation of pests and diseases, W. COTTRELL-DORMER (*Queensland Agr. Jour., 24 (1925), No. 3, p. 223*).—Sugar cane gummosis seems to be somewhat localized as indicated and to be resisted by the variety Q. 813, which, however, does not stand up well under the local heavy winds.

Sugar-cane diseases of the mosaic type in South Africa, Part II, H. H. STOREY (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 6, pp. 532–537, pls. 2, figs. 2*).—Notation has been made (E. S. R., 54, p. 250) of the first part (dealing chiefly with mosaic) of the account now amplified by this second part, which deals chiefly with sugar cane streak disease, distinguishable by its attacking freely Uba cane. A full report on sugar cane streak disease by the same author has been noted (E. S. R., 54, p. 251).

Red rot [of sugar cane], [W.] COTTRELL-DORMER (*Queensland Agr. Jour., 23 (1925), No. 1, pp. 73–75, figs. 3*).—Notes on the epidemic of sugar cane red rot in M. 1900 seedling in the West Plane Creek district briefly outline the disease situation and control measures, naming as very resistant varieties Q. 813 and others and as more or less resistant the variety D. 1135.

[Sugar cane diseases, Queensland], W. COTTRELL-DORMER (*Queensland Agr. Jour., 25 (1926), No. 4, pp. 316–320, figs. 12*).—Mosaic among canes is said to have increased at least 300 per cent in the Mackay areas during two years. *Aphis maidis* attacks certain of the smaller grasses, and appearances strongly suggestive of cane mosaic were commonly seen during these observations. Grasses so affected included *Panicum colonum* (wild millet), *P. sanguinale* (summer grass), *Sorghum* sp. (native sorghum), and *Setaria aurea* (rat-tailed grass). Clean farming is urged.

Gumming disease (*Bacterium vascularum*), present in all districts south of Mackay, also in the Cairns and Herbert River areas, is probably the most dangerous disease. Leaf scald occurs in all districts north of the Herbert River, in the Proserpine area, and recently on the Maroochy River.

Tomato blight disease, H. TRYON (*Queensland Agr. Jour., 24 (1925), No. 3, pp. 239–242*).—Noting animal enemies of the tomato plant in Queensland, the worst of which is said to be the soil inhabiting root gall forming nematode, the author lists also some injurious diseases. Among these, and probably the worst, is the tomato blight (*Phytophthora infestans*). This is discussed as to its significance under Queensland conditions and its control in this region. For this purpose Bordeaux mixture is presumably the cheapest and most effective preparation for prevention.

Tomato wilt and resistant varieties, N. A. R. POLLOCK (*Queensland Agr. Jour., 23 (1925), No. 3, pp. 188–190*).—A disease of the tomato plant, now popularly termed a wilt, first became injurious in the Bowen district about 1918, and afterwards became very prevalent at Bowen. The disease is briefly described as in association, supposedly causal, with *Fusarium* sp. Early tomato varieties proved to be very susceptible and later varieties resistant, a strain of Buckeye showing vigorous growth and total absence of the disease. This strain was named Bowen Buckeye. Six varieties in all are now discussed herein as disease resistant and as producing fruit of excellent quality. These are Bowen Buckeye, Roselawn Buckeye, Norton, Norduke, Columbia, and Denisonia.

[Spraying experiments with apples and peaches at the New Jersey Stations], A. J. FARLEY (*New Jersey Stas. Rpt. 1925, pp. 114–124, figs. 5*).—Spraying experiments with peaches (E. S. R., 55, p. 48) were continued during the year. The data emphasized the effectiveness of standard New Jersey dry mix for control of peach scab and the danger of reducing the sulfur content of spray mixtures even when the sulfur is in a very finely divided condition, such as colloidal sulfur. The various combinations of sulfur, lime, and lead arsenate were all very satisfactory as regards disease control and arsenical injury.

In spraying experiments with apples a study was made of the injury caused by some of the common insecticides and fungicides. Leaf injury produced by concentrated lime sulfur resembled that due to concentrated lime sulfur plus lead arsenate, the latter being usually more severe and showing 1 or 2 days after the spray was applied regardless of climatic conditions. The leaf tips seemed most susceptible to injury. Fruit on the trees treated with lime sulfur was not greatly injured early in the season. Bordeaux injury seemed to depend largely on weather conditions. Spraying tap water on leaves coated with Bor-

deaux mixture did not produce injury. The injury resulting from Bordeaux mixture plus lead arsenate was distinct from that caused by concentrated lime sulfur.

"Injury to fruit on the trees sprayed at pink bud was first observed about a month after the application. It took the form of a very severe russeting, often deforming the apple. This proves the point sometimes debated as to whether russeting can be caused by a spray applied at the pink bud stage."

Lead arsenate alone at the rate of 2 lbs. to 50 gal. of water resulted in practically no injury to leaf or fruit. Studies indicate that pressure, type of equipment, and method of application must all be taken into consideration in determining what dilutions of a given material can be used on various kinds of trees and plants.

On diseases known as "bark canker" and "die back" in fruit trees, H. R. Briton-Jones (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 162–183, pls. 6*).—The superficial bark canker due to *Mxyosporium corticolum* is supposed to have been known and originally described in America. Though constantly present on apple and pear trees 20 or more years of age, it requires no treatment as it causes little or no damage and in some cases may be advantageous to the trees. The supposed bark canker as previously described and also attributed to *M. corticolum* is said to occur only on trees in weak condition and to be caused by *Diaporthe perniciosa*. This fungus occurs commonly as a weak parasite, producing a die-back on apple, pear, and stone fruits. Organisms associated with die-back of stone fruits include *Cytospora* sp., *M. corticolum*, *D. perniciosa*, and rod-shaped bacteria. There is strong evidence that none of these organisms alone is primarily casual to the injury. The disease can not at present be satisfactorily controlled by direct action against any or all of the organisms found in this connection.

Biological observations on apple "scab" or "black spot" (Venturia inaequalis), E. S. Salmon and W. M. Ware (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 230–239, pl. 1*).—Apple scab or black spot may occur very early in the season. Some varieties appear more susceptible throughout the season than others. In some, severe scab infestation may occur on the leaves before the blossoms open, and this may pass unnoticed. Apparently a preblossom spray may be as necessary in England as in Canada and the United States. In England a showery or misty condition which makes spraying difficult also favors heavy scab infection. The spores, which are absolutely dependent upon drops of water for their propagation, appear to be of two kinds, namely, those from pustules occurring on scabbed wood of certain varieties and winter spores (ascospores) discharged abundantly from dead scabbed leaves of the previous season lying on the ground. Observations have shown that in England the perithecia are mature and ready to discharge spores considerably before the apple leaves begin to unfold, continuing in this state throughout the spring months. Such varieties as Bismarck should be sprayed in the pink-bud stage. The season of 1924, the worst within memory as regards apple scab, showed clearly the superior influence of earliness in spraying, at least in case of certain varieties. Such varieties as Cox Orange Pippin, Worcester Pearmain, and Bismarck will require this special early attention, though such resistant varieties as Lane, Beauty of Bath, and some others might be left until the later foliage had unfolded just after blossoming.

Control of "black spot" of apple, H. A. Mills and W. le G. Brereton (*Agr. Gaz. N. S. Wales, 35 (1924), No. 8, pp. 591–596*).—Bordeaux mixture, though recognized as a control spray for apple black spot, may cause damage which varies with varieties and with conditions, including the rapidity with

which copper sulfate is yielded. For this reason experimentation with lime sulfur was begun in 1913, and the present account details somewhat comparatively this and later work, with results which are somewhat variable.

Experiments for the control of black spot of apple, W. A. BIRMINGHAM and H. A. MILLS (*Agr. Gaz. N. S. Wales, 36 (1925), No. 9, pp. 665, 666*).—These apple black spot control studies show that Bordeaux mixture (6-4-50) between the early spur-burst and the pink stage, followed by the same at the calyx stage, gave the best control of black spot, *Venturia inaequalis*, with 88.2 per cent of clean fruit. Bordeaux mixture (6-4-50) between the early spur-burst and the pink stage, followed by lime sulfur (summer strength) at the calyx stage, was next in order of value, with 61.9 per cent of clean fruit. Bordeaux mixture tended to russet, while lime sulfur gave clean fruit of good appearance but showed a deficiency as regards black spot control.

Control of black spot, H. BROADFOOT (*Agr. Gaz. N. S. Wales, 36 (1925), No. 10, pp. 747-750*).—Most of the best commercial apple varieties which are indicated as produced in this section are susceptible to black spot (*Venturia inaequalis*), which develops particularly in common storage. A program which has given good results in tests by the department is Bordeaux mixture at bud-greening followed by an application of lime sulfur at the pinking and calyx stages and later applications with lime sulfur in case atmospheric conditions conduce to spot development. Spraying should be done at the time when infection occurs.

An uncommon watercore condition in apples, W. A. BIRMINGHAM (*Agr. Gaz. N. S. Wales, 36 (1925), No. 1, pp. 59-62, figs. 2*).—A watercore condition of King David apples is reported, the ascertained history of which, as stated, indicates that the condition is not due to any organism but is physiological, connected with severe pruning, resulting deficient transpiration, heavy rainfall, delay in picking, and possibly partial defoliation.

Gumming of drupaceous fruit trees, H. TRYON (*Queensland Agr. Jour., 24 (1925), No. 2, pp. 120-122*).—Gumming, said to affect plum, peach, apricot, nectarine, almond, and cherry, may occur in either of two forms, one of which is due to microorganisms and the other to factors or conditions listed as meteorological, soil, trees (grafted or not grafted), nature of stocks, and variety. These are discussed, as are also measures applying directly or indirectly to the trouble.

Plum aphis and brown rot control, A. H. LEES and H. R. BRITON-JONES (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3-4, pp. 196-199*).—Removal of all dead branches and twigs as a supplementary measure against brown rot is regarded as good practice and as practicable in small holdings, but not on large commercial plantations of grown trees. In the latter case, sprayings during the first year with 7 per cent carbo fluid and the maintenance of grease bands on the tree trunks control brown rot, aphis, and caterpillars. In subsequent years, 4 per cent carbo fluid and grease bands will suffice. The carbo fluid applied during dormancy does not injure such dormant intercrops as gooseberries and red or black currants.

A biochemical study of the false-blossom disease of the cranberry, C. P. SPAETH and H. R. KRAYBILL (*Jour. Agr. Research [U. S.], 34 (1927), No. 1, pp. 35-47.*)—A number of theories having been advanced as to the cause of false blossom of cranberries, a disease that has been known for 20 years or more, the authors thought that a chemical study of diseased and healthy plants might reveal some marked differences in metabolism and perhaps throw more light on whether the disease is due to faulty nutrition.

Cranberry plants having the disease false blossom were found to be higher in free reducing sugars, sucrose, starch, acid-hydrolyzable substances, and dry

matter and lower in moisture than healthy plants. The ash content of the tops of healthy plants was slightly higher than that of the diseased ones. No consistent differences were found in the nitrogen content, and the disease is not considered to be caused by excessive quantities of available nitrogen. It is suggested, as the result of analyses of healthy and diseased plants, that the false-blossom disease of the cranberry may be a virus disease similar to the yellows and mosaic diseases of other plants.

The blue stripe wilt of the raspberry, R. V. Harris (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 221–229, pls. 3*).—A disease of raspberry is described as causing wilt and death of the canes from below upward. The nature and the extent of injury are discussed. A Verticillium was very commonly isolated from affected stools of many varieties. A control experiment using the plate cultures of the Verticillium induced the characteristic field symptoms. The disease is designated as raspberry blue-stripe wilt. The control measures recommended are merely tentative.

"Leaf scorch" of strawberry, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 36 (1925), No. 3, pp. 213, 214, figs. 3*).—A strawberry leaf spot, specimens of which were received from La Pérouse, is said to be identical with a disease recorded for the United States and Canada. It is due to the fungus *Mollisia earliana*, the conidial stage of which is said to be *Marsonia potentillae*.

Downy mildew of the grape, H. L. Manuel (*Agr. Gaz. N. S. Wales, 36 (1925), No. 10, pp. 751, 752, fig. 1*).—In the Hunter River district the vintage was about 70 per cent below normal, due mainly to disease. It is estimated that probably 40 per cent of the reduction was due to downy mildew.

A "shrivel" condition of grape berries, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 35 (1924), No. 9, pp. 669–671, figs. 2*).—In January, 1924, temperatures as high as 104° F., preceded and followed by cool weather, were thought by some grape growers to have increased attack by downy mildew (*Plasmopara viticola*), some crops being ruined in connection with the shriveling effect on the berries. Investigation, however, showed that excessive transpiration had overtaxed the water-supplying capacity of the root systems, so that moisture was withdrawn from the berries, causing some to collapse.

Investigation of "bunchy top" disease of bananas, R. D. Watt, E. J. Goddard, and J. G. B. Osborn (*Queensland Agr. Jour., 21 (1924), No. 4, pp. 263–275, fig. 1*).—This is a report by a committee appointed, as the result of an agreement between the Commonwealth, New South Wales, and Queensland Governments, to investigate aspects of banana bunchy top disease and to make appropriate recommendations.

Banana culture in regions indicated is threatened with large losses or even extinction, to judge from the history of the disease as briefly outlined and from the present resulting situation. The planting of disinfected corms in soil treated with fungicides has failed to prevent the disease. Inquiry still in progress has revealed no specific causal parasitic organism, although various presumably predisposing or direct causes as suggested are discussed.

"Bunchy top" in bananas—its Queensland history (*Queensland Agr. Jour., 21 (1924), No. 3, p. 254*).—Credit is given to W. N. Gillies for historical details regarding banana bunchy top in Queensland, where it probably appeared between 1910 and 1912, though it was not formally reported until the year 1916 (by [A. H.] Benson), not regarded seriously until 1919, and not investigated experimentally until 1920. Subsequent studies are mentioned in the account by Darnell-Smith, which is noted below.

"Bunchy top" disease in bananas, G. P. Darnell-Smith (*Queensland Agr. Jour., 21 (1924), No. 3, pp. 169–179, figs. 3*).—The biologist, in this report, summarizes recent field observations and tests and outlines the present situation.

Supposedly, the cause of this disease is to be found in the roots or in the corm. It is suspected that the ultimate cause is a soil organism. Anthracnose (*Colletosporium* sp.), corm rots (from decaying tree roots or *Armillaria mellea*), and rust (thrips) apparently are not connected with bunchy top. A reputedly immune variety, tested under severe conditions, developed bunchy top.

Bunchy top in bananas (*Agr. Gaz. N. S. Wales, 37 (1926), Nos. 8, pp. 603–612, figs. 3; 9, pp. 697–705, figs. 6*).—An outline is given of the situation, which has been set forth above and by Goddard et al. (E. S. R., 56, p. 354).

Banana internal fruit discoloration, H. Tryon (*Queensland Agr. Jour., 24 (1925), No. 2, pp. 122, 123*).—Banana fruit internal discoloration is described as observed locally, with brief notes as to supposed primary and proximate causation, no remedy being yet available.

Disease in Manning River bananas (*Queensland Agr. Jour., 24 (1925), No. 3, p. 304*).—Credit is given to R. J. Noble for investigation of a disease which had almost wiped out plantain banana cultivation on the Manning River during the previous two years. Two species of Fusarium and one of Bacterium are found. The organism suspected as causal is said not to correspond to any of the types parasitic on bananas elsewhere. It attacks at any point, but most commonly through the roots, as it is said to harbor in soil refuse.

Brown rot in citrus fruits, E. M. Doidge (*Union So. Africa Dept. Agr. Jour., 10 (1925), No. 6, pp. 499–503, figs. 4*).—In 1921 and 1922, brown rot was reported on oranges in Victoria and South Australia. The fungus (*Pythiacystis citrophthora*) resides in the soil and is spread rapidly to the citrus fruits as a result of splashing rains. The rot is described, as is the causal organism.

On a new species of Alternaria causing a leafspot disease of Gomphrena globosa L., K. Togashi (*Bul. Imp. Col. Agr. and Forestry, Japan, No. 9 (1926), pp. 1–16, figs. 4*).—An injurious leaf spot of *G. globosa*, observed near Kyoto in August, 1924, was determined as a new species and named *Alternaria gomphrenae*.

Rubber tree diseases and their control, N. G. Teodoro (*Philippine Agr. Rev., 19 (1926), No. 1, pp. 63–73*).—Philippine rubber tree diseases are here discussed in connection with control measures.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Propagation of game birds, W. L. McAtee (*U. S. Dept. Agr., Farmers' Bul. 1521 (1927), pp. II+57, figs. 27*).—This is a practical account of the general requirements for the propagation of game birds. It applies primarily to the ring-necked pheasant, the bobwhite quail, the mallard duck, and the Canada goose, species with which most success has been achieved on American game farms, and secondarily to a number of other game birds that have been reared less extensively.

Pheasants: Their lives and homes, W. Beebe (*New York: Doubleday, Page & Co., 1926, vols. 1, pp. XXVII+[1]+257, pls. 34, fig. 1; 2, pp. XV+[1]+309, pls. 30*).—Volume 1 of this work includes a preface by H. F. Osborn. The introduction to the work gives a brief general account of pheasants, their daily round of life, and relation to man. The author then deals with Blood pheasants, Tragopan, Impeyan, Eared-, Kaleege, Crestless Fireback, Crested Fireback, and White-Tailed Wattled pheasants, and Junglefowl.

Volume 2 deals with the Koklass, Cheer, True, Long-Tailed, Golden, Bronze-Tailed Peacock, Peacock, Ocellated, and Argus pheasants, and peafowl. This is followed by an account of the care of pheasants in captivity (pp. 264–286). The characters and distribution of the 23 forms of *Phasianus colchicus* and important additions to our systematic knowledge of pheasants since the appearance of the last volume of the author's monograph, in 1922, are considered in appendixes (E. S. R., 48, p. 550). The various forms are illustrated by numerous colored plates.

Report of the department of biology, T. C. Nelson (*New Jersey Stas. Rpt. 1925, pp. 281–288*).—Reporting upon the results of the season's work, particularly with the oyster, the author discusses water examination as a guide to shelling, reactions of the oyster larva to light, artificial cultch, vertical distribution of oyster larvae—reactions to tides, temperature, and spawning of the oyster, metamorphosis without attachment in the larvae of the oyster and of the mussel, the bivalve station, and typhoid fever in oysters.

A micro method for estimating the relative distribution of glutathione in insects, D. E. Fink (*Science, 65 (1927), No. 1675, pp. 143–145*).—This is a contribution from the U. S. D. A. Bureau of Entomology.

Flowers and insects, XXIV, C. Robertson (*Ecology, 8 (1927), No. 1, pp. 113–132*).—In this contribution the author deals with color, conspicuousness, and odor, the conditions limiting the visits of insects, flower classes, dominant groups of insect flowers, etc.

The internal therapy of plants [trans. title], A. Müller (*Monog. Angew. Ent. No. 8 (1926), pp. VI+206, figs. 32; abs. in Rev. Appl. Ent., 14 (1926), Ser. A., No. 10, p. 505*).—This is a monographic account of control work with insect pests, particularly aphids, and diseases. Following a brief introduction a review is given of earlier work on the subject (pp. 2–60), followed by a report of experiments conducted (pp. 60–179), etc., and a bibliography of 9 pages. The work is of particular interest to entomologists because of the apparently encouraging results obtained in repelling the woolly apple aphid and other aphids through the absorption of pyridine, aluminum sulfate, etc., by the tree.

[Insect control] T. J. Headlee and E. N. Cory (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 48–62*).—The several papers presented at the annual meeting of this society held in November, 1924, include Some Principles Governing the Control of Codling Moth (pp. 48–51). The Oriental Peach Moth (pp. 52–56), and The Japanese Beetle in Relation to the State of Delaware (pp. 56–58), all by T. J. Headlee; and The Oriental Peach Moth (*Laspeyresia molesta*) (pp. 59–62), by E. N. Cory.

Report of the department of entomology, T. J. Headlee et al. (*New Jersey Stas. Rpt. 1925, pp. 359–414, 418, 419, 422–442, figs. 8*).—The first part of this report records the locality and date of occurrence of insects by order, as based on correspondence. Brief mention is then made of the more important insects of the year, including the European red mite (*Paratetranychus pilosus*), apple aphid (*Aphis pomi, A. sorbi, A. avenae*), green peach aphid, Chinese praying mantis (*Paratenodera sinensis*), Japanese beetle, codling moth, oriental peach moth (*Laspeyresia molesta*), eastern tent caterpillar, stalk borer, and bagworm.

An effort was made to extend the study of testing materials for the prevention of injury to stored seeds and grains by mixing the seeds with dust materials to the protection of wheat from the Angoumois grain moth. The influence of size of particle on effectiveness of certain dust materials is recorded in detail in tabular form. The results indicate that the attack of this pest may be repelled with small amounts of dusts.

The report of a chemical study made of the eastern tent caterpillar by W. Rudolfs has been noted from another source (E. S. R., 56, p. 757). Tabular data presented show that the moisture content of the eggs gradually decreased until a minimum was reached with the newly hatched larvae. Simultaneously, with the decrease of moisture, fat content decreased with an increase of nitrogen. As soon as the larvae started to feed the moisture content increased rapidly, while total nitrogen decreased slightly and fat content increased rapidly. With a certain optimum moisture content reached, ether-soluble material increased within a short time to 15 per cent, and when the larvae were ready for pupation their fat content reached 18.7 per cent. The transformation from larval to pupal stage was accompanied by an increase of fat to 24 per cent in the prepupal and 28.8 in the pupal stage. Part of this fat was apparently used up in the processes of transformation to the adult stage, for when the pupae were nearly ready for emergence the fat content was reduced to 26 per cent, and the adults contained 24.7 per cent of fat.

A brief reference is made to work with the codling moth in continuation of that of the previous year (E. S. R., 55, p. 51).

A report on biological studies of the oriental peach moth in 1924 is given by A. Peterson (pp. 379–386), much of the data being presented in tabular form. A recent summarized account of work on this pest by the author has been noted (E. S. R., 56, p. 258). Investigations on the control of the oriental peach moth by L. A. Stearns (pp. 386–402) are reported on in tabular and chart form. The experimental work in orchard cultivation, as well as insectary tests, seems to indicate that thorough cultivation will dispose of all the larvae not overwintering on the tree itself; also that in order to destroy these larvae (or pupae) in the spring this cultivation must exceed the depth of 3 in. Tabulated data indicate that the fungicidal and fungicide-lead treatments, applied both as sprays and dusts, gave no control of the moth whatever. It appears that all combination 40 per cent nicotine treatments applied as sprays gave varying degrees of control which were not attained by similar treatments applied as dusts containing 3 per cent nicotine. Observations made from May 30 until August 13 seem to indicate conclusively that the 3 per cent nicotine dust had little effect on the adults. The spray plats, in which 40 per cent nicotine 1:800 and 1:500 was added to the fungicide treatment either on 7 or 14 day schedules, all gave noticeable increases in the amount of oriental moth worm-free fruit. A plat which received the fungicide-lead-nicotine 1:800 treatment in six applications gave an increase in clean fruit amounting to 13.3 per cent. In this case no extra labor expense was involved, the treatment consisting simply in adding the nicotine to the usual spray solution. It is considered doubtful, however, that its use at either the 1:800 or 1:500 dilution, according to the tentative schedule, was as beneficial because of the extra cost involved in the two additional applications. The results of this experiment seem to indicate that the practical application of this spray is dependent upon a variable number of factors, of which the severity of the infestation, the cost of the treatment, and the prospective yield and value of the crop are the most important.

Observations on the effectiveness of electric lights in attracting adults led to the conclusion that the lighting system was of no practical benefit in combating the pest. A slaked lime lime-sulfur wash applied to trunks of peach trees showed twig injury on the trees which had been painted decidedly worse than on the trees the trunks of which had received no treatment, the difference in degree of fruit infestation being very slight and in favor of the trees which had received no treatment. Applications in February and March of calcium

cyanide 40 to 50 per cent, at dosages of 1, 2, and 3 lbs. to 1,000 cu. ft. of space, the exposure periods varying from one-quarter to seven hours and at a temperature of 60° F., show the pupa to be more resistant than larva to calcium cyanide. At no dosage were larvae killed at an exposure of less than one hour, and at all dosages the larvae were killed at exposures of three hours and upward. The pupae were not killed at any dosage at any exposure from one-quarter of an hour to seven hours. In tests with a number of other materials only negative results were obtained.

Results obtained by Peterson from the application of insecticides for the control of eggs of the apple aphid during the spring of 1925 are presented at length in tabular form. The previous conclusion that lime sulfur plus nicotine is the best spray for destroying apple aphid eggs is confirmed by the results here recorded.

Control work conducted during an outbreak of the green peach aphid is reported upon in tabular form. The data show that 40 per cent nicotine and soap proved the most effective, but the nicotine and dry mix, because it provided against brown rot, was probably the most practical. The dust materials showed themselves to be rather efficient on the terminals, but were relatively ineffective on the basal portions of the tree. In investigations of sticker dust v. sticker sprays it was concluded that the dust applications were less effective than the spray treatments. The first treatment with the lead oleate coated lead arsenate gave a beautiful coating of fruit and foliage, but the second, third, and fourth treatments did not adhere nearly so well.

Notes by C. S. Beckwith and B. F. Driggers on cranberry insects (pp. 418, 419) are incorporated in the report. They report that the cranberry girdler increased threefold during the year 1924. Their observations during the year definitely show that flooding in September controls the blossom worm (*Epiglaea apiata* Grote). As a result of keeping a coat of arsenate of lead on cranberry vines from July 1 to September 1, crop yields increased 10 per cent on the treated plats, although no particular insect was common on the bog. It was thought that this result was produced by eliminating the general leaf feeders during the growing period.

In the report on soil-infesting insects (pp. 422, 423), experiments in two localities made during the year to demonstrate the value of carbon disulfide emulsion and calcium cyanide as practical means of cleaning the soil of wireworms are referred to. These are in continuation of work previously noted (E. S. R., 55, p. 51). In the first experiment carbon disulfide emulsion was introduced into the furrow ahead of the plow by means of a special machine designed for the purpose at the rate of 0.67 oz. per square foot, and calcium cyanide into the furrow ahead of the plow with a special machine at the rate of 0.11 oz. per square foot. The applications were made on April 26, when the temperature of the soil was 50° F. By sinking on May 2 five holes, each 1.5 ft. square, to a depth of 2 ft. in each plat, 27 wireworms were found in the check plat, 12 wireworms in the carbon disulfide emulsion plat, and 10 wireworms in the calcium cyanide plat. In the second experiment carbon disulfide emulsion was applied in the furrow in sufficient water to give approximately 1 qt., containing 0.96 liquid oz. of actual carbon disulfide, per square foot, and calcium cyanide was applied at the rate of 0.128 oz. per square foot. The soil at the time of treatment was 60° at the depth of the plow. Examinations of the plats made on June 3 showed 31 live and no dead wireworms on the untreated plat, 2 live wireworms and 46 dead in the carbon disulfide emulsion plat, and 9 live and 43 dead in the calcium cyanide plat. It is pointed out that the cost per acre for the carbon disulfide emulsion was $192.80 and for the calcium cyanide treatment $51.39.

In a report on bee investigations, R. Hutson (pp. 423–433) refers to work conducted on the pollination of orchard fruit, an account of which has been noted (E. S. R., 55, p. 51). Reference is made to the disappearing and other little-known bee diseases and to a poisoning occurring in bees at West Freehold. Breeding work conducted at the mating station near Chatsworth is briefly reported upon. The procedure at the disease resistant apiary at New Lisbon and in the production yard at Lebanon is considered. Gaseous chlorine was used as a disinfectant for combs infected by American foulbrood with encouraging results.

The mosquito work is reported upon by Headlee and F. W. Miller (pp. 433–442). Following a brief reference to biological investigations on the mosquito, they include a preliminary account by W. Rudolfs upon the relation between mosquito breeding and environment (pp. 434, 435). The results of practical control work, including a discussion by Miller on furnishing information to boards of health and other organizations wishing to undertake locally supported mosquito-control campaigns, are considered.

The principal insect pests of the soy bean in Hokkaido [trans. title], S. KUWAYAMA (*Hokkaido Agr. Expt. Sta. Bul. 39 (1926), pp. [2]+94, pls. 2, figs. 27; abs. in Rev. Appl. Ent., 14 (1926), Ser. A, No. 7, pp. 329, 330*).—In this extended study of insect pests reported in Japanese, the author records more than 30 forms to be injurious to the soy bean in Hokkaido. A colored plate illustrates 14 of the number.

Dusting with calcium cyanide for banana thrips control, J. L. FROGGATT (*Queensland Agr. Jour., 27 (1927), No. 1, pp. 67–72*).—The author reports upon preliminary tests conducted which indicate that with calcium cyanide quicker and more certain results can be obtained in the control of the banana thrips (*Anaphothrips signipennis* Bagn.) than with either of the two previously recommended methods.

Preliminary report on the application of calcium cyanide dust to the control of Helopeltis in tea, W. H. BRITTAIN and W. S. SHAW (*Trop. Agr. [Ceylon], 67 (1926), pp. 209–214*).—The preliminary tests here reported are considered to have demonstrated clearly the extreme toxicity of calcium cyanide to Helopeltis.

Biology of the parasites and hyperparasites of aphids, H. SPENCER (*Ann. Ent. Soc. Amer., 19 (1926), No. 2, pp. 119–157, pls. 4, figs. 2*).—This is an account of studies made in Ohio in 1921 and continued until July, 1922. Following an introductory account the author deals with the aphid complex, including both physical and biological factors in natural control. He then deals with the parasites of aphids, including Aphidiinae (pp. 126–139) and Aphelinidae (pp. 140, 141). The hyperparasites are considered next, including *Lygocerus niger* How., *Asaphes americana* Gir., *Pachyneuron apidivorum* Ashm., and *Xystus brassicae* Ashm. The account concludes with a discussion of the interrelations, in which the aphid parasite complex, i. e., the relation between crops, aphids, parasites, and hyperparasites, is graphically illustrated in chart form.

Citrus aphids and the freeze, J. R. WATSON (*Fla. Grower, 35 (1927), No. 5, p. 5*).—The author points out that the occurrence in Florida of the coldest weather since 1918 probably increased the menace from the citrus aphid but at the same time gave the growers an unusual opportunity to combat it. Observations indicate that the cold did not kill the aphid, only 6 individual aphids in 5,000 observed the day after the freeze by R. L. Miller, assistant entomologist at Lake Alfred, having succumbed. The assistant entomologist at Gainesville, A. M. Tissot, found that the eggs of the citrus aphid on pears were hatching in large numbers, which is said to have been the first time the eggs of this aphid have ever been observed to hatch in Florida.

It is pointed out that while they had not been killed by the cold, undoubtedly the vast majority of them in the groves at the time of writing would die of starvation as the result of the destruction of the young foliage. Enough would survive, however, to give a heavy infestation in the spring if weather conditions were favorable and the growers did not take active means to exterminate them.

The author urges that the growers search for and destroy all colonies of the pest and thus prevent great losses as the result of the aphid when the injured trees put out the new growth. Pear trees in the neighborhood of groves should be inspected and the eggs or aphids destroyed by use of an oil emulsion.

The green muscardine disease in silkworms and its control, R. W. Glaser (*Ann. Ent. Soc. Amer., 19 (1926), No. 2, pp. 180–192, pls. 3*).—The loss of stock silkworms due to a fungus disease led to investigations of the infection in 1922, which were continued through the year 1925. It is shown that this fungus affects many insects of economic importance, and that reports of its use in combating insect pests are conflicting. Successful infection experiments are recorded. It is pointed out that the silkworms do not acquire the disease by swallowing the spores, but that when the spores lodge on the skin germination and infection soon occur. The time and course of events within the worms from infection to death and after are described, as are the various stages of the fungus found and their pathological effects on certain tissues.

A note on the cotton bollworms of South Africa, J. S. Taylor (*Ent. Rec. and Jour. Variation, 38 (1926), No. 11, pp. 151, 152*).—Brief notes are presented upon the Sudan or red bollworm (*Diparopsis castanea* Hamps.), which is the most important South African bollworm, cotton being the only crop attacked by it. The American bollworm is said to be the next in importance, its habits and life history being much the same as those of *D. castanea.* The spiny bollworm embraces 3 species (*Earias insulana* Boisd., *E. biplaga* Walk., *E. citrina* Saalm.), of which the first mentioned is a serious pest in India while the last has only lately been recorded on cotton in South Africa. It does not usually occur in South Africa in sufficient numbers to cause serious damage, but at times fairly heavy infestations are met with. Mention is also made of the pink bollworm, which is a serious pest to cotton in North Africa and has also been recorded in East Africa but has not yet appeared in South Africa.

Certain genitalic characters in Laspeyresia molesta Busck and Laspeyresia prunivora Walsh, S. W. Frost (*Ann. Ent. Soc. Amer., 19 (1926), No. 2, pp. 198–201, pl. 1*).—This is a contribution from the Pennsylvania Experiment Station in which anatomical data are given for the separation of *L. molesta* Busck from *L. prunivora* Walsh.

European corn borer, F. S. Purnell (*Cong. Rec., 68 (1927), No. 37, pp. 2447–2451*).—A summary of information on this disease as presented to the lower House of Congress on January 8, with the discussion which followed.

Pertinent information regarding the 1927 spring clean-up of areas quarantined on account of the European corn borer (*U. S. Dept. Agr., Misc. Circ. 102 (1927), pp. 7*).—This is a circular of information regarding the regulations for corn-borer control, recommendations, suggestions, outline of plan and organization, extra labor allowance, penalties and assessments, and equipment.

Observations on the spruce budworm, A. Gibson (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 19 (1925), Sect. V, pp. 195–206, pls. 3*).—Following a brief introduction the author reports upon a recent outbreak in Canada, the appearance and effect of the insect's injury and its life history, and gives descriptions of its several stages.

Notes on the life history and control of the strawberry leaf roller, E. W. DUNNAM (*Jour. Agr. Research [U. S.], 34 (1927), No. 2, pp. 149–156, figs. 3*).—This contribution from the Iowa Experiment Station on the biology of the strawberry leaf roller is based upon investigations conducted at Ames during the summer of 1923. The data, presented in tabular and chart form, deal with the longevity of adults, oviposition, incubation period, habits of larvae and injury to plants, length of larval period, length of pupal period, total life cycle, seasonal history, natural enemies, and control experiments.

The average length of the life cycle was 7.9 days for incubation of eggs, 22.7 days for larval period, 9.6 days for pupal stage, and 2.3 days for the preoviposition period, or a total of 42.5 days. There were found to be three complete generations of the strawberry leaf roller at Ames in 1923. Observations in the State made from 1915 to 1918 are said to establish definitely the fact that the leaf rollers spend the winter in the strawberry beds as nearly full-grown caterpillars. Early in the spring when the food supply is available they feed to some extent and soon transform to the pupal stage, and a few days later the adult moths appear. These moths of the overwintered brood lay eggs and give rise to the first generation, which appears in late May and early June. By June 15 larvae of all sizes and some pupae were found in the leaves. The parasites reared from larvae include *Sympiesis ancylae* Gir., *Meteorus trachynotus* Vier, *Hoplocryptus incertulus* (D. T.), *Spilochalcis albifrons* Walsh, and *Spilocryptus polychrosidis* Cush. The pupal stage of these parasites lasted from five to nine days when they were kept in the cool part of the insectary.

In the control experiments reported, lead arsenate applied at the rate of 1 lb. to 5 lbs. of gypsum was the most effective of the arsenicals tested. Lead arsenate at the rate of 1 lb. to 5 lbs. of slaked lime and calcium arsenate at the rate of 1 lb. to 10 lbs. of gypsum gave nearly as good results. The dust consisting of 1 lb. of calcium arsenate and 10 lbs. of slaked lime was about as effective as the various sprays.

Black flies in New Hampshire, W. C. O'KANE (*New Hampshire Sta. Tech. Bul. 32 (1926), pp. 24, figs. 8*).—This is a report of investigations conducted in continuation of those reported by Weed in 1904 (E. S. R., 16, p. 683), Conradi in 1905,[1] and Sunderson in 1910 (E. R. S., 23, p. 359). The present bulletin reports the results of experiments in control of black flies by oiling streams, together with records as to the effect of oil on fish, and an extended series of observations as to the species of black fly larvae occurring in New Hampshire streams and the circumstances under which each is found.

It is concluded that the larvae in streams may be killed by applications of phinotas oil of a miscible type. It is pointed out that fish are rather easily affected by the oil and that the margin between the minimum that will control larvae and the minimum that fish can endure is narrow. It was found that nets may help to protect fish, but sometimes may do harm. The treatment of an extended area was found necessary for satisfactory control in a given locality.

In the course of the investigation larvae were studied at 88 observation points representing many types of streams. Six known species of larvae were found, including *Prosimulium hirtipes* Fries, *Simulium venustum* Say, *S. vittatum* Zetterstedt, *S. bracteatum* Coq., *S. piscicidium* Riley, and *S. meridionale* Riley. Two species of larvae not hitherto described were found, including a Prosimulium and Simulium. *S. venustum* Say appeared in the largest proportion of collections. *P. hirtipes* Fries was abundant.

Further experiments on a bacterial disease of adult flies with a revision of the etiological agent, R. W. GLASER (*Ann. Ent. Soc. Amer., 19 (1926), No.*

[1] U. S. Dept. Agr., Bur. Ent. Bul. 52 (1905), pp. 100, 101.

2, pp. 193–198).—This is an account of further studies (E. S. R., 52, p. 558) of the bacterial disease of house flies caused by a specific organism described as *Staphylococcus muscae*. It was found that the virulence of *S. muscae* was not enhanced by successive passages through adult house flies. While the larval stage of the flies does not develop the disease, it is possible to infect them by contaminating their environment with the microorganism. The disease develops subsequently in a certain number of the adults.

Control work with the olive fly (Dacus oleae Rossi) in the Maritime Alps in 1923 [trans. title], R. Poutiers and G. Labdat (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 1, pp. 51–61, pl. 1, fig. 1).*—This is a report of control work conducted.

The fight against the Colorado potato beetle in 1924 [trans. title], E. Rabaté (*Min. Agr. [France], Ann. Off. Agr. Région. Sud-Ouest, No. 10 (1925), pp. 1–53).*—A detailed account of control work in France.

The striped cucumber beetle, D. Isely (*Arkansas Sta. Bul. 216 (1927), pp. 36, figs. 2).*—This is an account of studies of the life history, habits, and control measures of the striped cucumber beetle as applied to Arkansas conditions. An extended account of this pest by Houser and Balduf has been noted (E. S. R., 54, p. 661). In Arkansas it has two full generations a year, and parts of a third and fourth generation have been reared. From 40 to 45 days are required for passing through the immature stages under favorable conditions in midsummer. The tachinid fly *Chaetophleps setosa* is the most important enemy in Arkansas, since as high as 45 per cent of the beetles present in a field at one time may be parasitized. When the beetles are present in moderate numbers, fair protection may be obtained through spraying with arsenate of lead at the rate of 2 lbs. to 50 gal. of water or Bordeaux mixture. A mixture of calcium arsenate, 1 part, and ground gypsum, 10 to 20 parts, applied as a dust also gives fair control. Both act as repellents. Sodium fluosilicate and calcium fluosilicate are the only insecticides which actually kill large numbers of beetles and at the same time give the plants protection for a number of days against the migrating beetles. Sodium fluosilicate is the more effective of the two, but this insecticide occasionally injures plants on which it is applied and so should be diluted with 2 parts of lime. A list of 36 references to the literature is included.

The black alfalfa leaf beetle (Colaspidema atrum Olivier) [trans. title], A. Lécaillon (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 4, pp. 235–298, pls. 2, fig. 1).*—A monographic account of this enemy of alfalfa, including its morphology, reproduction, food habits, natural enemies, and control. A bibliography of 33 titles is appended.

The Japanese beetle, J. R. Springer (*Fla. State Plant Bd. Quart. Bul., 11 (1926), No. 1, pp. 1–7).*—A brief summary of information.

New intermediary insect host records for the giant thorn-headed worm of swine, R. D. Glasgow (*Ann. Ent. Soc. Amer., 19 (1926), No. 2, pp. 252–254).*—The author calls attention to the fact that *Phyllophaga rugosa* is an intermediate host and the adult beetle a carrier of *Macracanthorhynchus hirudinaceus* (Pall.) Trav. It is pointed out that the evident probability that larval cysts of this worm may be transported from place to place by the flight of the adult May beetles introduces a factor in the dissemination of this parasite which should certainly be taken into account in carrying out the so-called McLean County system of swine sanitation. The dissemination by adults of the intermediary insect host would seem to make the control of this parasite a community problem rather than a problem for the individual breeder.

The Buprestidae of Pennsylvania (Coleoptera), J. N. Knull (*Ohio State Univ., Dept. Zool. and Ent. Contrib. No. 87 (1925), pp. 71, pls. 10).*—This is a

synopsis of the family Buprestidae commonly known as the flat-headed or metallic wood borers, which is represented in Pennsylvania by 104 species.

Investigations on the biology of the vine flea-beetle (Haltica ampelophaga Guer.) [trans. title], F. Picard (*Min. Agr. [France], Ann. Épiphyties, 12 (1926), No. 3, pp. 177–196*).—In this account the author deals with its biology on the grape vine, hibernation, host plants, comparison with *H. lythri* Aubé, natural enemies, etc.

The apple blossom weevil [trans. title], R. Regnier (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 1, pp. 5–45, pls. 2, figs. 12*).—An extended account is given of studies of *Anthonomus pomorum* L. by the director of the Entomological Station at Rouen. Following an introduction the author deals with the anatomy of the several stages of this weevil, and reports upon its biology, natural enemies, economic importance, and control measures. The literature relating to it is reviewed in connection with a bibliography of 40 titles.

The life and habits of the honey bee, H. B. Arbuckle (*Jour. Elisha Mitchell Sci. Soc., 41 (1925), No. 1–2, pp. 47–63*).—This is a presidential address delivered at the annual meeting of the North Carolina Academy of Science in May, 1925.

Practical apiculture.—Products of the hive, P. Lemaire (*Apiculture Pratique. Les Produits du Rucher. Paris: J.-B. Baillière & Sons, 1925, 2. ed., pp. 159, figs. 56*).—This is a practical account.

Contribution to the knowledge of the interrelations of the bumblebees of Illinois with their animate environment, T. H. Frison (*Ann. Ent. Soc. Amer., 19 (1926), No. 2, pp. 203–235, pl. 1*).—The author here deals with the social parasites, including *Psithyrus* spp.; parasites of the adults, larvae, and pupae, including *Physocephala sagittaria* (Say), *Spherularia bombi* Duf., *Brachycoma sarcophagina* Town., *Mellitobia* sp., and *Parasitus* sp.; and insect enemies of the bumblebee comb, including *Vitula edmandsii* (Pack.), *Apanteles nephopteriois* (Pack.), and *Plodia interpunctella* Hb. Scatophagous associates and occasional lodgers are considered and miscellaneous enemies noted. A complete list is given of the known enemies of the bumblebees in Illinois and of the various inhabitants of varied status thus far found within their nests, and a bibliography of 39 titles is included.

A new Tiphia from Korea (Hym.), S. A. Rohwer (*Ent. Soc. Wash. Proc., 29 (1927), No. 1, pp. 19, 20*).—Under the name *T. koreana* the author describes a new species from Suigen, Korea, parasitic upon *Anomala sieversi*.

Present status of control work with the Argentine ant (Iridomyrmex humilis Mayr) in France [trans. title], R. Poutiers (*Min. Agr. [France], Ann. Épiphyties, 11 (1925), No. 4, pp. 301–311, figs. 6*).—This is a review of the control work being conducted in France, particularly at Cannes, where the pest has prevented the growing of truck crops in many districts.

ANIMAL PRODUCTION

The mineral feed problem in Wisconsin, E. B. Hart, H. Steenbock, and F. B. Morrison (*Wisconsin Sta. Bul. 390 (1927), pp. 23, figs. 15*).—The mineral requirements of the different farm animals, especially in regard to salt, iodine, calcium, phosphorus, and the vitamin which assists in mineral assimilation, are discussed. Illustrations of experimental animals show the effects of disregarding their mineral needs (E. S. R., 49, p. 167).

Potassium in animal nutrition, IV, V, H. G. Miller (*Jour. Biol. Chem., 70 (1926), No. 2, pp. 587–591, 593–598, figs. 2*).—In the work reported in part 4, Potassium Requirements for Normal Growth and Maintenance, it was found

that young rats on a ration containing less than 1 mg. of potassium per day fail to grow, and die within 8 weeks. The minimum daily intake for growing males is 15 mg. and for females 8 mg. The male apparently requires more potassium than the female for purposes other than increase in body weight. For mature animals the daily requirement is not over 2 mg. of potassium per day. The natural foodstuffs of this type of animal contain enough potassium to satisfy their needs.

In part 5, entitled Influence of Potassium on Urinary and Fecal Excretion of Sodium, Chlorine, Calcium, and Phosphorus, a marked increase in potassium intake of rats was found to be followed by increased excretion of sodium and chlorine in the urine. The sodium excretion was persistently higher during the period of high potassium intake.

Previous work has been noted (E. S. R., 56, p. 465).

Effect of a diet low in calcium on fertility, pregnancy, and lactation in the rat, D. Macomber (*Jour. Amer. Med. Assoc., 88 (1927), No. 1, pp. 6–13, figs. 12*).—Twenty-eight young vigorous adult rats weighing from 150 to 200 gm. at from 3 to 6 months of age were placed on a control diet containing 70 mg. of calcium for each 15 gm. of feed, 20 gm. of lettuce, and 10 cc. of water ingested. A second lot of 35 similar rats were placed on an identical ration except that it contained only 10 mg. of calcium for the same amount of food eaten. A plentiful supply of all the known vitamins was furnished each lot. After one month the animals were mated. Daily records were kept of the food eaten and the weights of adults and young. Vaginal smears were made daily to determine the stage of pregnancy. Observations were made on 200 pregnancies involving the birth of more than 1,200 young.

The results indicated that low calcium diets do not produce sterility in the adult rat, but they do affect fertility by increasing the intrauterine mortality. In the rat on a low calcium diet the young are normal at birth in weight and calcium content. The fetus receives its calcium at the expense of the mother's bones and teeth, and this loss of calcium by the mother is intensified during lactation. However, during this period the young do not get enough calcium for their needs and show the lack of it by stunting, weakness, and often death. The increasing demands of the young are not met, probably due to an increasing resistance of the maternal organism to sacrifice its reserve.

The relation of vitamins B and E to fertility in the male rat, H. A. Mattill (*Amer. Jour. Physiol., 79 (1927), No. 2, pp. 305–315*).—In this study apparently normal male rats were divided into groups and fed synthetic rations made up of casein, starch, lard, cod-liver oil, wheat germ oil, salt, and yeasts in varying amounts. They were mated with female animals for periods of from 6 to 10 days. As the males declined they were watched for paralysis of the hind legs. The males were killed without anesthetics in order that the motility of the sperm should not be affected. A record was kept of the weight of the testes.

Of the 21 male rats which succumbed to vitamin B starvation on a ration containing an adequate amount of vitamin E, only 2 showed degeneration when gauged by weight of the testes or by the presence of sperm. Of 6 animals deprived of both vitamins, none showed degeneration after an average of 63 days on the ration and after suffering an average loss of 39 per cent in body weight. An adequate supply of vitamin E is particularly necessary during the first 90 days of a rat's life. The loss of fertility in apparently normal gonads is thought to be due to faulty nutrition, which lowers the tone and vigor of the animal.

Meadow silage (*Livestock Jour.* [*London*], *105* (*1927*), *No. 2753, p. 61*).—Due to the fact that during wet weather difficulty is experienced in curing meadow hay, a test was undertaken at the Albert Agricultural College in Ireland to determine how far grass could be made into silage. A 26-acre field was divided, one-half being cut for hay in the usual manner and the other half being ensiled in a concrete tower silo. The two trials were simultaneous in dry sunny weather. The cured hay averaged 3,000 lbs. per acre, and the green material hauled to the silo weighed 7,000 lbs. per acre. The hay was of better than average quality.

An examination of the silage showed that it was damaged at the top and around the walls to a depth of 20 ft., and for 3 to 6 in. from the walls, with extensive mold. The sound material was palatable. A feeding trial showed that 20 lbs. of this silage were about equal in feeding value to 21 lbs. of mangels or 8 lbs. of hay from the same pasture.

Commercial feeding stuffs, September 1, 1925, to August 31, 1926, B. Youngblood, F. D. Fuller, and S. D. Pearce (*Texas Sta. Bul. 348* (*1927*), *pp. 133*).—This is a report of the feeding stuffs analyzed for the year ended August 31, 1926 (E. S. R., 55, p. 57).

The computed as compared with the directly observed fasting katabolism of cattle as a measure of the maintenance requirement of energy, E. B. Forbes, M. Kriss, and W. W. Braman (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 2, pp. 167–179*).—In an effort to find a true maintenance requirement of energy, a comparison was made of 62 determinations obtained by the heat-increment method and 18 determinations obtained by the directly observed heat production during fast.

The computed determinations varied between 662 and 1,643 Calories per square meter of body surface, the coefficient of variation being 17.93±1.12 per cent in terms of square meters of body surface and 19.52±1.23 per cent in terms of live weight. The direct determinations varied between 1,313 and 1,537 Calories per square meter of body surface, the coefficient of variation being 4.51±0.51 per cent in terms of square meters of body surface and 6.65±0.76 per cent in terms of live weight.

The relation between heat production and feed intake can not be represented graphically by a straight line. The direct determination shows that the utilization of feed energy is at a higher rate of efficiency for maintenance than is its utilization for body increase. The direct determination because of its narrow range of variation is being adopted as a standard, and the procedure is being perfected.

The nitrogen metabolism of steers on rations containing alfalfa as the sole source of the nitrogen, H. W. Titus (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 1, pp. 49–58, fig. 1*).—This is a study of the mutual influence of the proportion of the several nutrients in feeds on their digestibility. Five yearling steers were fed for a period of 226 days, and during that time nine digestion trials were conducted with them. The trials were 10 days in length with intervals of (a) 11 days between trials on the same ration and (b) 18 days between trials on different rations. Alfalfa hay, first cutting, was fed throughout the investigation and digestion trials run on it. Later an equal weight of crude fiber (filter paper pulp) was substituted and two digestion trials run. The amount of crude fiber was modified and digestion trials conducted for different times.

These data show that the metabolic nitrogen in the feces is influenced by the water content of the feces. A linear relationship exists between the nitrogen

content of the feces and the nitrogen content of the feed, also between the nitrogen content of the urine and the nitrogen content of the total excreta when the nitrogen content of the feed is varied. There is an approximate linear relationship between the nitrogen content of the urine and the nitrogen content of the feed if the animal is receiving more nitrogen than it requires for maintenance. Substituting paper pulp for part of the alfalfa caused an increased retention of nitrogen, and it is not believed that the fecal nitrogen excretion of a steer consuming a nitrogen-free ration can safely be taken as a measure of the metabolic nitrogen in the feces of an animal when consuming an equal weight of a given feeding stuff. The "true" digestibility of the nitrogen of alfalfa is approximately 88 per cent.

A study of three steer feeding problems, J. P. Sackville and J. E. Bowstead (*Alberta Univ., Col. Agr. Bul. 13 (1926), pp. 36, figs. 5*).—Two-year-old dehorned or polled steers of mixed breeding were used in all experiments.

A comparison of oat hay and oat silage.—Three trials begun during the winter of 1923–24 and run for two subsequent winters were conducted. For the three-year period the oat silage produced an average of 51.3 lbs. more gain than the oat hay. The feed required to produce a unit of gain was less, the cost of gain was less, and the selling price higher when oat silage was fed. One ton of oat silage replaced 1,320 lbs. of oat hay, 43.9 lbs. of prairie hay, and 105.9 lbs. of grain.

Full versus limited grain ration.—A comparison of full v. limited grain ration when fed with hay, silage, and protein supplement was begun in 1920–21 and carried on for four periods. The supplement was constant in each trial; during the first trial the amount of hay was purposely kept the same, and in the limited grain lot the allowance of grain was two-thirds that of the full-fed lot.

Limiting the grain ration resulted in (1) an increased consumption of silage, (2) a decrease of 10 per cent in digestible nutrients consumed, (3) an average of 7 per cent less rapid gain, (4) increased efficiency in feed utilization, and (5) a decrease in feed required per unit of gain and also total feed cost in every trial. The full-fed steers attained a higher finish and sold at a higher price per hundredweight.

Value of alfalfa hay and oat hay.—The data for this comparison were secured from three trials starting in 1923–24. The rations for the two lots consisted of either oat or alfalfa hay, a small amount of prairie hay, and grain.

Alfalfa hay had a greater feeding value than oat hay when no protein supplement was fed. Steers consumed on an average of 1.5 lbs. more hay and 1.12 lbs. more grain when fed alfalfa hay. The alfalfa hay produced more rapid and economical gains and a better finish than oat hay. The fattening of steers was found to be a satisfactory and profitable means for marketing either oat or alfalfa hay.

A study of various rations for finishing range calves as baby beeves, H. R. Guilbert (*California Sta. Bul. 418 (1927), pp. 19, figs. 2*).—In order to determine the value of certain feeds peculiar to California six lots of 12 calves each were started on an experiment and fed for 210 days. All feeds were full fed except in lots 1, 2, 3, and 4, where the amount of alfalfa hay was limited to 3 lbs. per head per day. The steers in lot 1 went off feed early in the experiment. Coconut meal seemed to have a constipating effect, and 2

steers in this lot were sick for a short period. The following table gives the detailed results of this experiment:

Results of 210-day feeding experiment in fattening baby beef

Item	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Average initial weight per head.....pounds..	416.87	420.83	415.62	416.39	412.98	414.03
Average daily gain per head.....do....	2.18	2.05	1.93	1.75	2.11	2.15
Average daily ration per head:						
Corn silage.....do....	11.85	12.62	13.51	27.14	....	....
Alfalfa hay.....do....	2.99	2.98	3.00	2.98	7.28	6.86
Rolled barley.....do....	8.73	4.14	[1] 1.11	....	9.55	9.07
Coconut meal.....do....	....	4.04	....	....	....	....
Raisin pulp.....do....	....	....	7.71	....	....	....
Cottonseed meal.....do....	.99	....	1.94	....	....	.98
Cold-pressed cottonseed cake.....do....	....	....	....	4.34	....	....
Feed for 100 lbs. of gain:						
Corn silage.....do....	542.58	614.36	700.75	1,547.20	....	....
Alfalfa hay.....do....	136.88	145.89	155.47	170.22	345.50	318.09
Rolled barley.....do....	399.61	201.41	[1] 57.74	....	453.68	420.69
Coconut meal.....do....	....	196.50	....	....	....	....
Raisin pulp.....do....	....	....	399.79	....	....	....
Cottonseed meal.....do....	45.12	....	100.66	....	....	45.47
Cold-pressed cottonseed cake.....do....	....	....	....	247.66	....	....
Dressing percentage.....	61.00	61.63	61.89	59.18	61.32	62.79

[1] Barley was substituted for raisin pulp during the last 30 days.

At the end of the experiment the steers in each lot were graded according to the difference in finish. Lot 1 graded 8 choice and 4 good; lot 2, 5 choice and 7 good; lot 3, 4 choice, 6 good, and 2 medium; lot 4, 4 good and 8 medium; lot 5, 4 choice, 6 good, and 2 medium; and lot 6, 5 choice, 6 good, and 1 medium.

Beef cattle in Montana, L. Vinke and C. N. Arnett (*Montana Sta. Circ. 133* (*1927*), *pp. 67, figs. 45*).—A popular publication covering the status of beef production in Montana. Feeding and management of breeding and fattening cattle, the various feeds available in the State, and their relative feeding value are discussed. The market grades and classes are described and illustrated, and the economics of the purchase and sale of cattle is considered. A brief section is devoted to the necessary equipment for the cattle ranch.

The maintenance requirement of the adult sheep, T. B. Wood and J. W. Capstick (*Jour. Agr. Sci.* [*England*], *16* (*1926*), *No. 2, pp. 325–333*).—In an attempt to interpret feeding trials with sheep, it was found that sum of the accepted figure for maintenance requirement and the allowance for live weight increase did not account for the whole of the ration consumed. The authors concluded that the accepted figures were too low. The surface area of a 100-lb. sheep is 1.15 square meters, and the maintenance requirement corresponds to 26 calories per square meter per hour. This requirement is quite low in comparison with other animals.

The mean figure of 1.1 lbs. of starch equivalent was adopted as the maintenance requirement of a sheep per square meter per day for sheep weighing 100 lbs. When transposed this means 49 calories per square meter per hour. If the basal metabolism is in sheep as in other animals, about 80 per cent of the maintenance requirement, the basal metabolism would be about 40 calories per square meter per hour. The maintenance requirement for sheep of other weights can be found from the relation that it is proportional to the two-thirds power of the weight.

A technical study of the maintenance and fattening of sheep and their utilization of alfalfa hay, H. H. Mitchell, W. G. Kammlade, and T. S. Hamilton (*Illinois Sta. Bul. 283* (*1926*), *pp. 221–252*).—This is a detailed account of work previously noted (E. S. R., 54, p. 861).

Supplements to alfalfa for range ewes on feed, W. E. JOSEPH (*Natl. Wool Grower, 16 (1926), No. 11 pp. 17–19, figs. 2*).—Six experiments at the Montana Experiment Station, three comparing the value of corn and cottonseed cake and three comparing corn, cottonseed cake, and oats as supplements to alfalfa hay for range ewes, are reported in this article. These experiments, started during the winter of 1922–23, were carried on for the three subsequent winters, using the same ewes, with some additions from year to year.

During the winter the ewes were fed in lots from 24 to 30 ft. wide and from 120 to 140 ft. long. Each lot had access to a shed for shelter. The average length of the four periods was 95 days. The hay used was first-cutting alfalfa, but in some cases there was an admixture of timothy. The corn, oats, and cottonseed cake were fed to the respective lots in amounts needed to keep the gain of these lots uniform with the lots receiving hay only.

The average results indicate that there is practically no difference in the amount of hay replaced by a pound of corn or cottonseed cake. The hay replacement value of 1 lb. of cake was 2.76 lbs. and for corn 2.75 lbs. When corn and oats were compared, it was found that the replacement value of oats was 2.35 lbs. as compared to 2.44 lbs. in the case of corn. On the whole there was little difference in the comparative value of the three feeds. Based upon the results so far obtained, cake ranks first, corn second, and oats third, with less difference between cake and corn than between corn and oats.

Bean feeding, C. P. WILSON and J. L. LANTOW (*New Mexico Sta. Bul. 155 (1926), pp. 24, figs. 5*).—The work reported in this publication is an attempt to establish the feeding value of pinto and tornillo beans for fattening lambs and of pinto, mesquite, and tornillo beans for fattening pigs. One test to determine the palatability and effect upon egg production of the tornillo is also reported (E. S. R., 43, p. 378).

For fattening lambs pinto beans were found to be 85 per cent as efficient as corn in producing gains. Whole tornillo beans were only 44 per cent as efficient as corn. Grinding the tornillo bean increased its efficiency somewhat.

On cooking, the pinto bean made a satisfactory feed to furnish some of the protein in a ration for fattening swine. The raw beans were unsatisfactory.

Mesquite and tornillo beans varied widely in feeding value. Because of the hard outer coats, the size, and the high sugar content of the seed it is quite difficult to grind them in an ordinary mill so that they may be digested easily.

[Swine feeding investigations at the New Jersey Stations], F. G. HELYAR (*New Jersey Stas. Rpt. 1925, pp. 175–178*).—The results of three experiments are noted.

Fish meal and tankage as sources of protein.—Four lots of 7 pigs each averaging 62.3 lbs. were fed for a period of 93 days. Two lots were fed on rape pasture and the other 2 in dry lot. One lot of each division was fed tankage and the other fish meal as a protein supplement. The lot fed tankage on rape pasture made an average daily gain of 2.06 lbs., while those fed fish meal made 1.41 lbs. In the dry lot the pigs fed tankage made 1.63 lbs. average daily gain, and those fed fish meal made 1.96 lbs.

Hogging down corn.—The work previously reported (E. S. R., 55, p. 62) was continued with slight variations. On October 28, 1924, 16 pigs averaging about 140 lbs. were turned in on a 3.12-acre lot in which the yield was calculated to be 40 to 50 bu. of corn per acre. The pigs remained in the lot until December 12, and during that time made an average daily gain of 1.45 lbs. per head. They ate in addition to the corn 135 lbs. of wheat middlings and 215 lbs. of tankage. The calculated value of the corn after subtracting the cost of middlings and tankage was $36.48 per acre.

A study of protein selection by swine.—In a study of protein selection by swine, 12 pigs kept separately in $\frac{1}{10}$-acre lots with 4 vegetable and 3 animal proteins in separate self-feeders constantly before them almost invariably chose skim milk powder as a supplement to corn. Tankage, fish meal, soy bean meal, linseed oil meal, and alfalfa were practically untouched, and the consumption of wheat middlings was greatly reduced. The pigs were fed for 91 days, and the average daily gain for the 12 pigs was 2 lbs. per pig.

The effect of minerals in overcoming breeding difficulties in certain sows, R. G. Baskett (*Agr. Prog. [Agr. Ed. Assoc., London], 3 (1926), pp. 34–36*).—Sows on a ration of maize meal 65 per cent, pollards (wheat bran) 25 per cent, and meat meal 10 per cent failed to develop strong healthy pigs at weaning time. These sows had been run on a pasture that was excessively soured until a few weeks before farrowing, then brought in and housed in concrete pens. Under this system of management the sows farrowed an average of 7 pigs per sow, of which 2.4 pigs were raised to weaning time.

In December, 1924, these sows had a mineral mixture of ground limestone 10, steamed bone flour 25, common salt 10, iron oxide 2.5, and sulfur 2.5 parts added to their ration at the rate of 4 lbs. to every 100 lbs. of basal ration. Under this system the sows averaged 10.4 pigs at farrowing time and raised 7.1 pigs to weaning. It was evident that while sows were on the original diet there was an absence of a physiological balance of mineral matter, and the sows could not transmit a proper balance of minerals to the pigs through the milk.

Breeding and feeding the market hog, G. B. Rothwell (*Canada Dept. Agr. Pamphlet 74, n. ser. (1926), pp. 23, figs. 2*).—This publication is a discussion in a practical form of the breeding and feeding of market pigs based on experiments, practices, and observations at the Dominion Experimental Farms.

Judging swine, E. G. Godbey (*Clemson Agr. Col. S. C., Ext. Bul. 79 (1926), pp. 24, figs. 17*).—The judging of hogs in general, with score cards for the various common breeds of swine, is discussed in this bulletin.

Hogs for South Carolina, L. V. Starkey (*Clemson Agr. Col. S. C., Ext. Bul. 80 (1926), pp. 39, figs. 20*).—This publication discusses the advantages and disadvantages of hog raising in South Carolina. The breeds of hogs, judging, showing, feeding, and management of hogs are considered.

The bacon hog: Breeding, growing, and finishing, W. Toole and R. G. Knox (*Ontario Dept. Agr. Bul. 320 (1926), pp. 15, figs. 8*).—A revision of Bulletin 299 (E. S. R., 50, p. 575).

Poultry feeding: Principles and practice, W. F. Holst and W. E. Newlon (*California Sta. Bul. 417 (1927), pp. 48, figs. 6*).—A discussion of the food nutrients and their use by poultry, the composition of a poultry ration, and the use of grains and protein supplements in the ration is contained in this publication. Rations are suggested for laying hens and chicks, and recommendations are made for the feeding of birds for various purposes and during the different seasons of the year.

Results of feeding experiments, 1925–1926, R. T. Parkhurst (*Idaho Sta. Circ. 43 (1927), pp. 8*).—Further studies of the effect of various rations for laying hens were made with 14 lots of 25 pullets each (E. S. R., 52, p. 874). These lots were fed from October 1, 1925, to September 1, 1926. All pens received wheat as the scratch portion of the ration. Pens 1 to 8, inclusive, had a basal mash of equal parts of bran, shorts, corn meal, ground oats, and pea meal. Lots 9 to 14, inclusive, had the same mash with the pea meal omitted. Each mash contained 0.25 lb. of salt and 1 lb. of charcoal for each 100 lbs. of mash, and all lots were given free access to oyster shell and granite grit. Lots 1, 2, 3, 4, 9, 10, and 11 received unlimited sour skim milk in addition

to their mash feed. The supplements in the lots were as follows: Lots 1 and 4, lawn clippings; lot 2, 1 lb. of cod-liver oil to 45 lbs. of wheat; lot 5, 20 per cent of meat scrap; lot 6, unlimited sour skim milk whey; lot 7, 1.5 lbs. of buttermilk curd per 25 birds; lot 8, 12.5 per cent of mash dried buttermilk; lot 9, 20 per cent of alfalfa meal; lot 10, 20 per cent of bean meal; lot 12, 10 per cent of milk albumin and 25 per cent of milk casein; lot 13, 1.5 lbs. of milk curd per 25 birds; and lot 14, 25 per cent of milk casein.

Sour skim milk again proved the most valuable supplement, followed by milk curd. Alfalfa meal showed the best results in hatchability and size of eggs. Cod-liver oil proved somewhat superior to alfalfa meal in production and cost of eggs per dozen. Lot 3 receiving no green feed had a mortality of 23 out of 25 birds.

A comparison of the animal protein supplements showed sour skim milk superior to the others. With the dried semisolid buttermilk there was a larger percentage of small eggs than with the sour skim milk. Dried buttermilk gave slightly higher profit, cheaper cost per dozen eggs, and a higher hatchability than the semisolid buttermilk.

The rank of the vegetable protein supplements in order of productivity and profit was pea meal, alfalfa meal, bean meal, and no supplement. In size of eggs alfalfa meal ranked first, and in hatchability bean meal was the most efficient.

Feeding and management of breeders, R. T. PARKHURST (*Idaho Sta. Circ. 44 (1927), pp. 4*).—A popular presentation of the feeding and management of breeding chickens.

Hatching chicks artificially, R. T. PARKHURST (*Idaho Sta. Circ. [46] (1927), pp. 8*).—This is a popular presentation of the care and management of eggs during the incubation period. Some of the causes of poor hatches are noted, and the author appends a list of "do's" and "don't's" which are valuable in preventing poor hatches.

[Poultry investigations at the New Jersey Stations], G. W. HERVEY (*New Jersey Stas. Rpt. 1925, pp. 188, 189, 191, 192, 196–198*).—Results of several experiments with poultry are noted.

Ultra-violet light as a means of promoting growth.—Five lots of 200 chicks each were fed normal rations to which was added in the mash feed 0.25, 0.5, 1, and 2 per cent and no cod-liver oil. They were confined in a brooder house with no exposure to sunlight except through window glass. At the end of 12 weeks those receiving cod-liver oil were no more thrifty than those getting no oil. By the end of the fifth week leg weakness began to develop in all lots. Irradiating these chicks with ultra-violet light rays for 10 minutes daily for 10 days failed to cure the leg weakness. Chicks hatched at the same time and run on open range did not develop leg weakness when fed 2 per cent cod-liver oil in the mash, but 3 per cent of the chicks with no cod-liver oil on the range developed leg weakness.

Chicken tissue as a protection against rickets.—In collaboration with A. F. Hess, rats were fed a rickets-producing ration for a period of 3 weeks. After this time definite amounts of ovarian and fatty tissue from adult fowls were added to their ration. The rats fed ovarian tissue developed slight rickets, while those fed fatty tissue did not. The tissues were taken from laying hens, on a normal ration, that were exposed to sunlight through an open window.

Variability of feed consumption observed in Leghorns.—An analysis of feed and production records for 3,000 birds by pens weekly has shown three things: (1) In the winter period, November to February, egg production is directly proportional to the amount of scratch grain consumed up to 15 lbs. per 100

birds, (2) during the spring period, March to June, or summer period, July to October, there is no marked relationship between production and consumption of scratch grain, and (3) egg production increased directly according to the amount of mash consumed during the winter and summer periods, but there was no such relation during the spring period.

Length of laying cycle as an indication of seasonal egg production.—An analysis of the first-year records of 400 White Leghorn females was used to interpret the relationship between the number of days in a single cycle of continuous egg laying and the egg production for each season. It was found that a significant relationship existed between the length of laying cycle and total egg production for the winter (November to February) and spring (March to June) periods, but no relationship for the summer (July to September) period.

Requirements in body weight for efficient egg production.—A study was made of the records of the first Vineland egg-laying contest to determine the relationship of body weight of fowls to egg production. The year was divided into three periods, winter, spring, and summer-fall. Of the five breeds studied, it was found that a reasonably heavy body weight was necessary for maximum production during the winter and spring periods of both the pullet and yearling years, but for the summer-fall period the weight tended to be lower. Weight during the yearling year was lower than during the pullet year. The weights given in the American Standard of Perfection for pullets of American breeds are about the same as the optimum for egg production. The standard weight for all yearling hens was higher than the optimum weight for egg production. Excessive body weight during the summer-fall period and yearling year is secured at the expense of egg production.

The nutritive requirements of poultry (*Scot. Jour. Agr.*, *8* (*1925*), *No. 1*, *pp. 62–69*).—The results of experimental work with poultry in Scotland and Ireland are noted.

The effect of adding vitamin rich substances to normal rations, J. B. Orr, M. Moir, H. Newbigin, G. S. Robertson, and M. Murphy.—Three experiments are reported, in all of which the birds used in corresponding groups were of the same age and strain and kept under the same conditions with regard to housing and extent and nature of range. In the first experiment the ration containing yeast was being fed at the time the experiment started. A group of 20 pullets was divided into two lots and fed the same ration, except that in the control group the yeast was omitted. In the second experiment a ration containing no yeast was fed to the control group, and the same ration with 5 per cent yeast was fed to a corresponding group. In a third experiment one group was fed a ration containing calcium, phosphate, and yeast. The other group was fed the same ration without yeast, but with the phosphate increased by the amount present in yeast.

The withdrawal of yeast from a ration which contained it led to no significant difference in egg production, and the addition of yeast to a ration which did not contain it was not followed by an increase in egg production. When the phosphorus content of the ration was identical, as in the last experiment, there was no significant difference in egg production. The authors conclude that poultry kept under natural conditions and fed a well-balanced ration does not need any additional vitamin B.

The mineral requirements, J. B. Orr, M. Moir, A. Kinross, G. G. Esslemont, G. S. Robertson, and M. Murphy.—In these experiments the birds were fed on ordinary rations of mash consisting of cereal products and whole grains. Oyster shells or limestone grit or both were provided ad libitum in all but two cases, and the birds had a limited range of pasture. The mineral mixtures were added to the mash. The mineral mixture used consisted of bone meal

50 per cent, chalk 20, common salt 20, sulfur 5, iron oxide 5 per cent, and a trace of iodine. This mixture was added at the rate of 5 per cent to the ration. Studies were made as to the effect upon both egg production and growth.

The egg production when the mineral mixture was fed was increased beyond the limits of experimental error in every case. In the growth experiment, the addition of minerals was sometimes followed by a decreased growth rate. It was evident that minerals should be added to a growing ration, depending upon the minerals already present. When cereals were fed it was concluded that the ration could usually be improved by the addition of lime, phosphates, and common salt.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the New Jersey Stations], J. W. Bartlett (*New Jersey Stas. Rpt. 1925, pp. 216–223*).—Results of experiments are briefly noted.

Rations for dairy heifers during winter months.—Yearling heifers wintered in a barn and fed alfalfa hay and silage ad libitum made the same growth as those wintered in an open shed and full-fed grain, hay, and silage. The increase in body weight was practically the same in both groups. The cost of wintering was much less in the group kept in the barn.

Minimum milk requirement for raising dairy calves.—Studies are being made to determine what feeds may be substituted for milk in raising dairy calves. Calves were accustomed to their feed at 3 weeks of age and when 30 days old all milk was taken from them. In addition to the grain they received alfalfa meal ad libitum. A mixture of 20 lbs. of yellow corn meal, 10 lbs. of wheat bran, 20 lbs. of skim milk powder, 30 lbs. of ground oats, 20 lbs. of linseed oil meal, and 2 per cent of salt proved very satisfactory. Calves fed this mixture were healthy, kept in good condition, and looked much like skim milk fed calves.

Effect of temperature and humidity on the milk production of dairy cows.—Temperature records were taken during 215 lactation periods of cows fed grain, silage, hay, and beet pulp, except during summer when beet pulp was discontinued. The data showed that if the temperature factor does influence daily production its effect is not for any definite period. The temperature factor probably works in connection with some other factor, such as humidity.

Feeding trial to determine the value of Protozyme as a supplement to grain rations for dairy cows.—Two groups of cows were fed the regular herd ration except that 5 per cent Protozyme was added to the ration of one group. This feeding was continued for one month and then reversed for a similar period. No marked difference was noted in milk production while cows were receiving Protozyme.

Buckwheat hulls v. *wood shavings as a bedding for dairy animals.*—A laboratory test showed that 0.5 lb. of wood shavings exposed to water for 5 minutes absorbed 1 lb. 4 oz. of water. A like amount of buckwheat hulls treated in the same manner retained 1 lb. 2.6 oz. of water. The buckwheat hulls were satisfactory in maintaining the appearance of dairy animals, but the hulls sometimes lodged between the digits, often setting up infection.

Okra feeding to dairy cows, F. R. Edwards (*Georgia Sta. Bul. 145 (1927), pp. 182–184*).—Two cows were fed by the double reversal system for 2 periods of 12 days each, with a 3-day preliminary period, to find the value of okra for feeding dairy cows. The cows were fed 8 lbs. of a mixed grain daily and all the okra or green sorghum they would consume. Composite samples of milk

were taken for butterfat tests, and the cream from the separator was made into unsalted, uncolored butter.

The cows ate on an average 27.2 lbs. per head more okra than they did chopped sorghum and produced about 3 lbs. more milk per day. This increase in milk production was probably partly due to increased feed consumption. No difference was noted during the 2 periods in the color, flavor, odor, or appearance of the milk produced.

The butter produced from a cream during the okra-feeding period had a somewhat lower iodine number and a higher Reichert-Meissl number than that made from cream produced during the sorghum-feeding period. The okra butter apparently had a somewhat higher melting point. Both samples appeared normal in color, odor, flavor, and texture. Chemical tests showed no evidence of pectins or other mucilaginous carbohydrates in the okra butter.

Dried brewers' yeast vs. linseed oilmeal as a protein supplement for dairy cows in milk, H. Barton, A. R. Ness, and E. W. Crampton (*Macdonald Col., McGill Univ., Tech. Bul. 3 (1926), pp. 30*).—Two trials to compare the relative values of dried brewers' yeast and linseed oil meal are reported. The first of these trials was for three 21-day periods. The second trial consisted of three 30-day periods. The double reversal system was used in both trials, with 7- and 10-day preliminary feeding periods. The ration consisted of grain, silage, hay, and either dried brewers' yeast or linseed oil meal. Daily records were kept of milk production, and a butterfat test was taken once during each period.

In the first trial the cows on dried brewers' yeast produced 4.1±3.45 lbs. of milk more than those on linseed oil meal. However, a difference of 10.94 lbs. was required to make the results significant. In the second trial the difference was 7±6.05 lbs., with a requirement of 22.18 lbs. for significance. From these data, the authors concluded that dried brewers' yeast may be substituted pound for pound for linseed oil meal in rations for milking cows. The suggestion is made that the brewers' yeast be incorporated with the brewers' grains and sold in that form. Such a practice would materially increase the value of the grains. Appendixes give detailed data concerning the individual cows in the experiment.

Exercise as a factor in digestion trials with dairy cows, H. B. Ellenberger and B. H. Schneider (*Vermont Sta. Bul. 262 (1927), pp. 12*).—The average results of 16 digestion trials show slightly lower coefficients of digestibility for all nutrients except nitrogen-free extract by the milking cow when no exercise is given during the trial than when moderate exercise is allowed. The difference is small and may be considered of minor importance.

Milk goat improvement, O. C. Cunningham (*New Mexico Sta. Bul. 154 (1926), pp. 42, figs. 40*).—The results of grading up native milk goats by the use of a purebred sire of the Toggenburg breed are described. Some of the rations used successfully for milk goats at this station are given. A brief comparison of goat's and cow's milk and a short description of the leading milk breeds are included. Pictures of the native does and their offspring are appended.

Some variations of the heat method for sterilizing milking machines, L. H. Burgwald (*Jour. Agr. Research [U. S.], 34 (1927), No. 1, pp. 27–33*).—In order to prolong the life of the rubber parts of milking machines and at the same time get good results bacteriologically, the work previously noted (E. S. R., 54, p. 876) was continued. Three single units were used in this test. Immediately after milking each unit was rinsed by drawing clean, cold water through by vacuum, washed with a brush in hot water (110 to 120° F.) containing wash-

ing powder, and rinsed in clean, hot water. The buckets and heads were treated in the same manner and rinsed again in hot water before using.

All the units were placed in hot water (163°) for about 30 minutes. At this time one unit was removed and placed in a refrigerator and another in a weak solution of chlorinated lime. The other unit remained in the hot water between milkings. In another test with three units, one was sterilized in hot water (148°) and allowed to remain therein between milkings. The other two were sterilized in water (162°). At the end of about 33 minutes one unit was removed, hung in a warm room with an average temperature of 75.5°, and protected from dust and contamination. The other unit remained in the water between milkings. The bacterial count of milk drawn in the machines sterilized in different manners was compared.

The experiments indicate that sterilizing units at from 160 to 167° for about 30 minutes and placing in weak chlorine solution or hanging in a refrigerator will give excellent bacterial results, and that the life of the rubber parts will be materially longer than when units are allowed to remain in hot water between milkings. Hanging in a clean, warm place did not give as low bacterial counts as the other methods. Sterilizing at temperatures of from 145 to 150° increased the life of the rubber parts but did not give nearly as low bacterial counts.

The treatment of milk by an electrical method, S. C. Prescott (*Amer. Jour. Pub. Health, 17 (1927), No. 3, pp. 221–223*).—Milk from the receiving tank is forced through a regenerative cooler where it is warmed to about 118° F. by exchange with hot milk on the outside. It then passes through a cloth filter to remove dirt and foreign matter and reaches the treating chamber, where it is subjected to an alternating current of 220 volts, 60 cycles. The temperature rises to between 158 and 160°. From the heating chamber the hot milk passes to the regenerative cooler where its temperature is lowered by exchange with cold raw milk, and then passes over brine pipes where the temperature is further reduced to about 40°.

The taste and appearance of the milk were apparently not affected by the treatment, and the keeping qualities were excellent. A study of the reduction of the number of bacteria showed that during the winter months the raw milk gave a count of less than 200,000 bacteria, and a reduction percentage of approximately 90 per cent was observed. In the warmer months the bacterial count ran from 500,000 to 600,000 bacteria, and the reduction percentage varied from 97 to 98.5 per cent. Of the 20,000 thermophilic organisms in raw milk, 80 per cent were destroyed by this treatment. No colon nor tubercle bacilli survived the treatment.

Mechanism of the symbiosis of the lactic and putrefactive microbes [trans. title], I. R. Ul'rikh (Ulrich) (*Gosud. Inst. Opytn. Agron., Trudy Selsk. Khoz. Mikrobiol. (State Inst. Expt. Agron., Bul. Bur. Agr. Microbiol.), 1 (1926), pp. 109–144, figs. 8*).—A study of the symbiotic relationship between *Bacterium esteroaromaticum* and *B. lactis acidi* was made with the idea of utilizing the former in cheese making. Simultaneous inoculation of sterilized skim milk was a failure because the *B. lactis acidi* overran the *B. esteroaromaticum* and the latter disappeared in a few days. *B. esteroaromaticum* was grown in flasks on milk for different lengths of time at 32° C. and inoculated from time to time with *B. lactis acidi*. The results showed that *B. esteroaromaticum* reached its maximum stimulating effect in 8 days. After such a period *B. lactis acidi* did not develop well, and in a 25-day culture of *B. esteroaromaticum* the *B. lactis acidi* did not develop at all in 20 hours' time. The control cultures showed a titratable acidity of 53 (degrees of Turner), while the *B. esteroaromaticum* culture showed an acidity of from 103 to 105 in a 6-day culture.

Similar work was done with *B. fluorescens liquefaciens* and *Proteus vulgaris*. The latter organism had the same stimulating efficiency as *B. esteroaromaticum*; *B. fluorescens* was weaker in its stimulating effect. All old cultures of putrefactive organisms hinder the development of *B. lactis acidi*. Diluting with sterile milk, milk sugar solutions, or even pure water was sufficient for normal stimulating effects. Apparently it is a question of diluting toxic substances.

The by-products of casein decomposition prevent the rapid accumulation of acid produced by the *B. lactis acidi* organism.

Ropy milk in British Columbia, W. Sadler and M. J. Mounce (*Brit. Columbia Dept. Agr., Dept. Research Bul. 1 (1926), pp. 16, fig. 1*).—Two samples of ropy milk from different sources yielded bacteria of different types as the contaminating agents. The first sample was contaminated with *Bacillus lactis viscosus* and the second with *Escherichia neapolitana*. The water used in washing the equipment was the chief source of these bacteria.

Remedial measures, such as the use of chloride of lime and live steam for cleansing the equipment and the curbing and covering of wells to keep out surface drainage and other sources of contamination are recommended. Cleaning and disinfecting the stables and milk room aid in preventing the spread of these bacteria. Pasteurization at a temperature of 140° F. for 10 minutes kills the first type and at 145° for 30 minutes the seecond type.

Study of exposition butter, H. W. Gregory (*Butter, Cheese, and Egg Jour., 1927, Feb. (mo. ed.), pp. 42, 44, 46, 48*).—A study of the scores of butter samples at the 1926 National Dairy Exposition is reported in this article. The latter part of June 186 entries were received, scored, and placed in cold storage at —10° F. until October 4, when they were again scored. For making these studies the samples were grouped according to their scoring in June into seven classes, the first class being those that scored 94 or better.

All of the samples scoring 94 or better in June used a starter, the amount varying from 4 to 20 per cent. The acidity of these tubs varied from 0.11 to 0.2 per cent. The pasteurization temperature varied from 145 to 160° and the holding period from 20 to 45 minutes. There seemed to be no relation between different pasteurization temperatures and the score and keeping qualities of the butter. The relation of yeasts, molds, and total bacteria showed very little relationship either to salt content or keeping quality. The salt content of these samples varied from 0.46 to 2.1 per cent. The butter which did not contain over 1.39 per cent of salt made a higher average score in October than did those containing over 1.39 per cent of salt.

Of the 186 samples entered in the contest, 145 tubs were made with a starter. Of the samples which contained a starter 20.6 per cent scored the same in October as they did in June, 29 per cent increased in score, and 50.3 per cent decreased. Of the samples which did not contain a starter 17.9 per cent scored the same in October as in June, 41 per cent increased in score, and 41 per cent decreased.

Seventy-four of the samples scored 93 or better in June, and 70 of these were made with a starter. Of these 14 made the same score in October, 5 increased, and 51 showed a lower score. Of the 4 tubs made without a starter, all showed a decrease in score in October.

Factors influencing overrun, D. J. Retief (*Union So. Africa Dept. Agr., Sci. Bul. 51 (1926), pp. 23*).—This is a detailed discussion of the factors influencing the overrun of butter.

Creamery inspection in New Jersey, G. I. Ball (*New Jersey Stas. Bul. 445 (1927), pp. 16, figs. 3*).—This is the usual report of the creamery inspections in New Jersey for the year ended June 30, 1926 (E. S. R., 55, p. 268).

VETERINARY MEDICINE

Eleventh and twelfth reports of the director of veterinary education and research, I, II (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pts. 1 (1926), pp. 817, pls. 76, figs. 92; 2 (1927), pp. [3]+819–1361, pls. 9, figs. 13*).—The papers presented in part 1 of this report (E. S. R., 52, p. 82) include the following: Serological Investigations into Some Diseases of Domesticated Animals in South Africa Caused by Trypanosomes, by E. M. Robinson (pp. 7–25); Does a Species of Leishmania Occur in the Goat? by H. H. Curson (pp. 27–30); Blood Studies: A Contribution to the Study of the Blood and Circulation in Horse-Sickness, by C. P. Neser (pp. 31–53); Remarkable Case of Volvulus in a Calf, Due to Aplasia of the Mesentery, by W. Steck (pp. 55–60); Contributions to the Helminth-Fauna of South Africa, by J. G. Baer (pp. 61–136); Note on the Decomposition of Diluted Polysulphide Dips, by J. P. van Zyl (pp. 137–143); A Group of Micro-organisms Transmitted Hereditarily in Ticks and Apparently Unassociated with Disease, by E. V. Cowdry (pp. 145–158); Cytological Studies on Heartwater, I, II, by E. V. Cowdry (pp. 159–196); The Anatomy and Life-History of the Fowl Tapeworm (*Amoebotaenia sphenoides*), by H. O. Monnig (pp. 197–206); Helminths Collected from the Domestic Fowl (*Gallus domesticus*) and the Domestic Pigeon (*Columba livia*) in Natal, by P. L. le Roux (pp. 207–217); Helminthological Notes, by H. O. Monnig (pp. 219–228); The Life-Histories of *Trichostrongylus instabilis* and *T. rugatus* of Sheep in South Africa, by H. O. Monnig (pp. 229–251); The Appearance of *Gonderia ovis* in the Blood of Splenectomized Sheep, by G. de Kock and J. B. Quinlan (pp. 253–256); The Chlorophyll-Content of Grasses in Bechuanaland, by M. Henrici (pp. 257–271); Report on the Transmission of Nagana in the Ntabanana and Mhlatuze Settlements, Zululand, by G. A. H. Bedford (pp. 273–300); *Urginea macrocentra* (Baker): Its Toxic Effects on Ruminants, by D. T. Mitchell (pp. 301–327); Krimpsiekte, by M. W. Henning (pp. 329–365); Splenectomy in Domesticated Animals and its Sequelae, with Special Reference to Anaplasmosis in Sheep, by G. de Kock and J. B. Quinlan (pp. 367–480); Check-List of the Muscidae and Oestridae Which Cause Myiasis in Man and Animals in South Africa, by G. A. H. Bedford (pp. 481–491); Preliminary Report upon the Occurrence of Hydrocyanic Acid in the Grasses of Bechuanaland, by M. Henrici (pp. 493–498); Black-quarter in South Africa, with Special Reference to Improved Methods of Inoculation, by P. R. Viljoen and J. R. Scheuber (pp. 499–570); Necrobacillosis in Equines: Clinical, Pathological, and Aetiological Studies on an Outbreak, by J. B. Quinlan, W. Steck, and E. M. Robinson (pp. 571–615); Physiological plant studies in South Africa, I, II, by M. Henrici (pp. 617–702); A Check-List and Host-List of the External Parasites Found on South African Mammalia, Aves, and Reptilia, by G. A. H. Bedford (pp. 703–817).

In part 2 an account is given by A. Theiler in cooperation with five associates on Lamsiekte (Parabotulism) in Cattle in South Africa (pp. 819–1361), a popular account of which has been noted (E. S. R., 42, p. 477).

Report of chief veterinary surgeon for the year ended 30th June, 1925 (*N. S. Wales Dept. Agr., Rpt. Chief Vet. Surg. 1925, pp. 7*).—This report includes an account of the occurrence of infectious diseases of livestock and control work.

Second progress report of the Foot-and-Mouth Disease Research Committee, C. J. Martin et al. (*London: Min. Agr. and Fisheries, 1927, pp. 117; abs. in Vet. Rec., 7 (1927), No. 11, pp. 236–238*).—This is the second progress report (E. S. R., 54, p. 275) submitted by the committee to the Minister of

Agriculture and Fisheries in January, 1927. The research work is reported upon under the headings of study of the virus (pp. 6–14), plurality of types of virus (pp. 14–16), experimental infection of animals not readily susceptible to the disease (pp. 16–18), characters of the disease induced in farm animals by experimental inoculation (p. 18), cross-infection experiments between cattle and guinea pigs (p. 18), and immunity (pp. 19–24).

The further attempts to cultivate the virus lead the authors to consider it probable that most of the reported successful attempts can be best explained by survival rather than by multiplication of the virus. In discussing sources of the virus it is pointed out that upon successive passage through guinea pigs a virus of very high potency can be obtained and maintained for long periods. In both laboratories the epithelium from vesicles on guinea pigs' feet kept in 50 per cent glycerin in the cold room remained active for periods of 6 months or more. The viability of the virus, after drying on fabrics, hair, hay, etc., and the survival of virus in carcasses of infected guinea pigs, cattle, and pigs, as affected by heat, light, and some chemicals, are considered. The virus in defibrinated blood dried on hay was active after 4 but not after 7 weeks. The virus was not recoverable from the flesh after rigor mortis, and its accompanying considerable development of acidity, had occurred. The blood, however, whether the carcasses were frozen or chilled, was infective for 30 to 40 days and the bone marrow for still longer periods; in two instances for 76 days. After dry or wet salting the virus was recovered from the bone marrow after 42 days.

The disease was readily conveyed to pigs by feeding them upon crushed bones from the frozen carcasses containing infected marrow. Its resistance to 50 and 60 per cent alcohol, to chloroform, and to glycerin, noted in the first progress report, has been confirmed by experiments in both laboratories. The resistance of the virus to formalin (40 per cent formaldehyde) was tested with especial care since this disinfectant was chosen to kill the virus in the preparation of a dead vaccine. It was found that a concentration of 0.1 per cent of commercial formalin always destroys the virus in vesicle fluid diluted 1 to 50 or in infective serum after 48 hours at 26 to 27° C. Similar samples of virus after treatment with 0.01 per cent formalin was still active after 2 days.

In a study of the two types of the virus which differ in that one type of virus does not immunize against the other though they are indistinguishable clinically, as first described by Vallée and Carré (E. S. R., 47, p. 81), the authors found a very marked difference in the immunity produced, although a slight degree of cross immunity was occasionally observed. The so-called O type appears to occur much more commonly in France and Great Britain than the A type. In the study of the fixity of the two types by passage through other species of animals, there was no indication that either virus had undergone any modification after passing four times through both pigs and sheep. In experimental work a partial immunity was produced in guinea pigs by the injection of formalized virus. An immunity was obtained in 6 cattle by the subcutaneous injection of serum followed by doses of living virus administered intramuscularly.

A study was made of serum of recovered and hyperimmunized animals, which contains protective substances as employed in Europe to diminish the spread of the infection through inducing a temporary resistance to the disease. It has been found useful in the treatment of stock in the neighborhood of an outbreak or while being moved from one place to another. The observations on natural and acquired immunity to the disease suggests possibilities for the ultimate protection of farm animals that are encouraging.

A detailed report of work at the Ministry's veterinary laboratory at New Haw and at the experiment station at Pirbrigh (pp. 27–68) and also of work at the Lister Institute of Preventive Medicine, London (pp. 69–105), are presented in appendixes. A list of important papers on foot-and-mouth disease additional to those given in the bibliography of Gins and Krause in 1924 [6] is included (pp. 106–117).

An infectious granular vaginitis of cows, F. S. Jones and R. B. Little (*Jour. Expt. Med., 45 (1927), No. 3, pp. 519–528, pl. 1*).—The authors deal with the etiology and pathology of this disease in connection with a review of the literature. In the investigation conducted at the department of animal pathology of the Rockefeller Institute for Medical Research, a Gram-negative bacillus with tiny polar granules was found in the exudate. This organism measures from 1μ to 2μ in length and stains with difficulty. It was obtained in pure culture by inoculating the exudate into tubes of slanted agar to which defibrinated horse blood had been added. Its growth occurs only in sealed tubes, and it possesses slight pathogenicity for guinea pigs. The introduction of freshly isolated culture into the vagina of heifers and young calves resulted in acute inflammation, which terminated in the characteristic granular stage of the disease.

The feeding of Drymaria and Euphorbia to cattle, J. L. Lantow (*New Mexico Sta. Press Bul. 517 (1927), pp. 2*).—This is a tabular report of a steer feeding experiment with Drymaria and Euphorbia weeds conducted in the fall of 1925 by the station in cooperation with the U. S. D. A. Bureau of Plant Industry. No ill effects to the steers due to eating the weeds were observed, their pulse and temperature running practically normal during the whole experiment.

Blood cells in the healthy and affected horse, dog, and hog [trans title], P. Hikmet (*Arch. Wiss. u. Prakt. Tierheilk., 55 (1926), No. 2, pp. 222–250, fig. 1*).—This is an extended review of the literature in connection with a list of 35 references, followed by a report of studies conducted.

The endemic goiter of swine [trans. title], E. Clerc (*Beitr. Path. Anat. u. Allg. Path., 76 (1927), No. 3, pp. 444–470, figs. 8*).—This report of studies considered in connection with a review of the literature includes a list of 33 references.

Experiments on the treatment of hookworm infection in dogs, A. Gulati (*India Dept. Agr. Mem., Vet. Ser., 3 (1926), No. 7, pp. 167–184, figs. 6*).—A mixture of carbon tetrachloride and oil of chenopodium was found to be the best of all the drugs tested, being partially effective in dislodging the worms in three cases.

[Report of work in poultry pathology at the New Jersey Stations], F. R. Beaudette (*New Jersey Stas. Rpt. 1925, pp. 199–213*).—The first part of this report consists of a tabulation showing the frequency and distribution of diseases and parasites of poultry, based upon examinations made during the year. Fowl plague appeared in 12 counties of the State, from which 44 specimens were examined. Fowl typhoid was found for the first time in baby chicks as well as in young stock, the organism being isolated from the ovary of an adult hen and also from the unabsorbed yolk of a baby chick. It is stated, from the evidence at hand, that this disease, like bacillary white diarrhea, can be transmitted through the egg. Septicemia in adult fowls, caused by *Bacterium pullorum*, was determined in five cases during the year. Infectious bronchitis was of frequent occurrence, affecting younger birds, and appeared to be very contagious.

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[6] Ergeb. Allg. Path. Mensch. u. Tiere, 20 (1924), pt. 2, pp. 805–912.

Investigational work showed the organism causing an outbreak in canary birds to be very closely related to the human paratyphoid type B (*B. schottmulleri*). From a series of agglutinin-absorption tests it was found that the organism was identical with *B. pestis caviae*, as previously noted (E. S. R., 55, p. 476). An affection in squabs known as megrims by pigeon fanciers was found through agglutinin-absorption tests to be identical with the paratyphoid organism isolated from canary birds (E. S. R., 55, p. 476). In observations of the occurrence of oocysts of *Eimeria avium* in the cecal contents of domesticated fowls it was found that many adult birds carry a mild infection and probably serve as reservoirs of infection.

The para-typhoid B-suipestifer group of bacteria: Studies in differentiation, P. R. Edwards and L. F. Rettger (*Jour. Bact., 13 (1927), No. 2, pp. 73–97*).—The studies here presented are said to be an outgrowth of a preliminary study of *Bacterium anatum*, first observed by Rettger as the etiological agent in very extensive and fatal epidemics of young ducklings in Connecticut and Massachusetts, and described in 1920 as representing a new species (E. S. R., 42, p. 779). Sixty strains of the *B. paratyphosum* B-*B. suipestifer* group were studied with regard to their fermentative reactions, agglutination, complement fixation, and agglutinin absorption. The present collection of *B. anatum* strains is said to be divisible into two types by the serological tests, one of which is serologically identical with *B. aertrycke*. The other type does not correspond to any of the paratyphoid organisms with which comparison has been made. The authors find that by the use of complement fixation two types of *B. anatum* can be clearly distinguished, but *B. aertrycke* and *B. paratyphosum* B can not be differentiated. By agglutin absorption it is possible to divide this group into several types. Three main types are established in this way, *B. suipestifer*, *B. paratyphosum*, and *B. aertrycke*. Besides these three types there are apparently several independent strains.

Bacillary white diarrhea, O. M. Wilbur (*Maine Agr. Col. Ext. Circ. 94 (1927), pp. 4, fig. 1*).—This is a practical account.

Critical tests of tetrachlorethylene as an anthelmintic for foxes, K. B. Hanson (*Jour. Agr. Research [U. S.], 34 (1927), No. 2, pp. 129–136*).—This is a report of work conducted by the U. S. D. A. Bureau of Biological Survey in which chemically pure tetrachlorethylene in gelatin capsules was administered to foxes after a fast of 16 to 20 hours. This chemical was fonnd to be as effective as carbon tetrachloride in the removal of hookworms, and apparently more so in the removal of ascarids. The author found the effective dose to be 0.2 cc. per kilogram (1 cc. per 11 lbs.), as recommended by Hall and Shillinger for dogs (E. S. R., 54, p. 73), making 1 cc. about the proper dose for the average-sized adult fox. It was found that in contrast with carbon tetrachloride the administration of tetrachlorethylene apparently is not attended with the danger of inhalation intoxication. The contraindications for tetrachlorethylene are thought to be the same as those for carbon tetrachloride. In the absence of contraindications, the safety factor for tetrachlorethylene is very high. It is pointed out that even in therapeutic doses tetrachlorethylene may produce liver injury. Since the simultaneous administration of a purgative or laxative diminishes the efficacy of tetrachlorethylene, it is advisable to administer an effective purgative one to two hours after administration of the tetrachlorethylene, as it probably lessens intestinal absorption of the anthelmintic and diminishes the extent of liver injury.

AGRICULTURAL ENGINEERING

Civil engineering specifications and quantities, G. S. Coleman and G. M. Flood (*London, New York, and Calcutta: Longmans, Green & Co., 1926, pp.*

XV+282, *figs. 8*).—The purpose of this book is to present to civil engineers and those in allied branches of engineering a knowledge of the fundamental facts which must be considered in preparing specifications and quantities for construction work. Chapters are included on general considerations respecting contracts; contracts with Government and local Government authorities; general instructions and conditions in contracts; materials of construction; workmanship; schedules and quantities; schedules, forms of orders, and tenders; certifying of work for payment; guarantors and sureties; and arbitration as affecting civil engineering contracts. Five appendixes are included.

Water power and irrigation in the Jefferson River basin, Montana, J. F. DEEDS and W. N. WHITE (*U. S. Geol. Survey, Water-Supply Paper 580–B (1926), pp. II+41–116, pl. 1*).—Data are presented on the present and potential power and irrigation development in the Jefferson River basin of Montana. The area covers about 10,000 sq. mi. in extreme southwestern Montana, most of which is rough, nontillable, mountainous land. However, broad open valleys and terraced benches of smooth tillable lands occur here and there.

Geology of No. 3 reservoir site of the Carlsbad irrigation project, New Mexico, with respect to water-tightness, O. E. MEINZER, B. C. RENICK, and K. BRYAN (*U. S. Geol. Survey, Water-Supply Paper 580–A (1926), pp. IV+39, pls. 2, figs. 2*).—The results of an investigation of the character and structure of the rocks in the vicinity of the reservoir site and of the ground water conditions in these rocks are reported. The conclusion is drawn that there is danger of serious leakage from the proposed reservoir, and that the risk therefrom is too great to warrant the construction of a dam designed to impound water to any height approaching the elevation of 3,260 ft.

Progress in sub-grade soil investigations, F. H. ENO (*Roads and Streets, 67 (1927), No. 2, pp. 82–88*).—In a contribution from the Ohio State University a résumé is given of results obtained by different agencies in subgrade soil studies.

Infiltration through plastered and unplastered brick walls, F. C. HOUGHTEN and M. INGELS (*Jour. Amer. Soc. Heating and Ventilating Engin., 33 (1927), No. 4, pp. 249–258, figs. 8*).—Studies are reported from which the conclusion is drawn that in the total heat loss through an unplastered brick wall the infiltration loss amounts to from 30 to 40 per cent. It was found that plaster, either when applied directly on the brick or with furring and lath, is very effective in reducing heat loss by infiltration. Paint will reduce infiltration through a plastered wall to a small percentage of its original value, but its effect in conserving heat is relatively unimportant.

Laboratory manual of testing materials, W. K. HATT and H. H. SCOFIELD (*New York and London: McGraw-Hill Book Co., 1926, 3. ed., pp. XII+182, figs. 35*).—This is the third edition of this book. It contains chapters on general instructions, definitions (stress, elasticity, and resilience), materials stressed beyond the elastic limit, testing and testing machines, list of experiments, and instructions for performing experiments. Appendixes are included on common formulas, specifications for materials, standard forms of test pieces, and strength tables.

Public Roads, [March, 1927] (*U. S. Dept. Agr., Public Roads, 8 (1927), No. 1, pp. 20+[2], figs. 24*).—This number of this periodical contains the status of Federal-aid highway construction as of February 28, 1927, together with the following articles: Subgrade Studies of the Bureau of Public Roads, by C. A. Hogentogler, I. B. Mullis, and A. C. Benkelman; The Trend of Highway Design, by A. G. Bruce and R. D. Brown; and Proportioning Concrete Aggregates by Weight, by R. W. Crum.

The stationary spray plant, H. L. Garver (*Washington Col. Sta. Bul. 212* (*1927*), *pp. 42, figs. 20*).—Practical information is given on stationary spray plants for orchards, together with the results of tests of individual features of existing plants and data on installation costs.

Tests of the effect of pressure on atomizing and carrying distance of spray showed that as the distance became greater the percentage of large drops when compared to other drops also became greater. This was evidently due to the fact that the large drops will travel farther than the small ones. There was also a decided tendency for the area covered to increase consistently as the higher pressures were used. The results indicated that the time required for spraying with high pressure is much less than with the lower pressures, and that a greater degree of atomizing was done with the higher pressures than with the lower ones. The mist and small drops also carried much farther.

Unclean seed wheat causes loss of millions (*U. S. Dept. Agr., Misc. Circ. 95* (*1927*), *pp. 3, figs. 3*).—Three common types of grain cleaners are illustrated.

Stack and grain drying, W. Aitkenhead (*Indiana Sta. Circ. 139* (*1926*), *pp. 4, figs. 5*).—The results of experiments on stack and grain drying are briefly presented, together with a description of the equipment used. The equipment followed the same general plan as that developed by the Institute of Agricultural Engineering at Oxford University, with the exception that the hot gases of combustion are mixed with the air blown into the stack. Two alfalfa and two soy bean stacks were dried. The stacks were built over a conical pole frame, and an air trench 18 in. square led into the center of the cone.

The necessity for evenness in building was indicated, as after 4 hours blowing parts of a 5-ton alfalfa stack, which permitted an easy passage of air, were dry clear to the outside, while the dense hay was still damp 30 in. from the outside.

A 12-ton stack of soy bean hay was greatly overdried by 11 hours of blowing. An 8-ton stack of soy beans was well dried with 5 hours' blowing with the ingoing air at 150° F. A heavy shower preceded the building of a 10-ton alfalfa stack from hay in the swath. This stack was blown 7.5 hours with air at a temperature of 162°, and, due to uneven building, it dried in a somewhat patchy manner. However, when taken down 2 days later it was well fit for the mow.

A portable poultry house for the farm (*North. Ireland Min. Agr. Leaflet 21, rev.* (*1927*), *pp. 4, pl. 1*).—Practical information is given on the planning and construction of a portable poultry house for farms in Northern Ireland, together with working drawings and a bill of materials.

Sewage research (*New Jersey Stas. Rpt. 1925, pp. 45–51*).—The progress results of chemical, zoological, and bacteriological studies being conducted on Imhoff tanks are briefly presented. In the zoological studies it was definitely shown that some direct relationship exists between the numbers of protozoa present and the behavior of the tank. Every time the tank foamed the numbers increased enormously. Progress results are also given on the digestion of fresh solids, and on the effect of stirring, the addition of fresh solids to ripe sludge, partial sterilization, and chemical precipitation, some of which have been noted from time to time in the *Record*.

RURAL ECONOMICS AND SOCIOLOGY

Report of the advisory committee on research in agricultural economics (*Jour. Farm Econ., 9* (*1927*), *No. 1, pp. 111–129*).—This report is noted editorially on page 1.

[Papers presented at the seventeenth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 9 (1927), No. 1, pp. 1–110, fig. 1*).—A brief report of the meeting at St. Louis on December 28–30, 1926, including the following papers presented at the meeting: Rural Depopulation, by T. N. Carver; The Farm Problem, by F. O. Lowden; The Outlook for Agriculture, by E. G. Nourse, with discussions by T. N. Carver, G. F. Warren, C. J. Brand, B. H. Hibbard, and O. C. Stine; Land Grant College Curricula, by F. A. Buechel, with discussion by C. L. Holmes; Agricultural Economics Curricula, by O. G. Lloyd; The Cooperative Marketing Association as a Factor in Adjusting Production to Demand, by H. E. Erdman; Some Long-Time Effects of Cooperative Marketing, by R. S. Valle; and Some Observations on the So-Called Agricultural Ladder, by G. H. Von Tungeln.

Problems of prosperity: A series of addresses and papers presented at the annual meeting of the Academy of Political Science in the City of New York, November 17, 1926, edited by P. T. Moon (*Acad. Polit. Sci. New York, Proc., 12 (1927), No. 2, pp. XII+145*).—The following addresses and papers are included: Better Economic Organization of Agriculture, by A. Shaw; Agriculture and the Tariff, by C. C. Davis; Agriculture and the Tariff, by H. C. Taylor; Agriculture and the Tariff, by L. J. Dickinson; Power on the Farm, by A. Williams; Power on the Farm, by H. R. Seager; How Seasonal Requirements of Agriculture Affect Dependent Industries, by C. J. Brand; and Equality for Agriculture with Industry, by G. N. Peek.

The farm real estate situation, 1926, E. H. Wiecking (*U. S. Dept. Agr., Dept. Circ. 377 (1927), pp. 19, figs. 5*).—The changes in the value of farm real estate from 1920 to 1926, and the changes in farm ownership during the year ended March 15, 1926, are discussed. The farm real estate values are those of the United States Census of 1920, the preliminary reports of the agricultural census of 1925, and the Bureau of Agricultural Economics annual indexes of the average value per acre on March 1, based on estimates made by well-distributed correspondents. The values include buildings, and the figures are simple State averages weighted for geographic divisions and the United States by the relative State acreages of improved land, as shown by the 1920 census. The data on farm ownership were compiled by the Bureau of Agricultural Economics from reports of approximately 10,000 farmers and 5,000 farm real estate dealers, appraisers, bankers, etc., and are weighted similarly to the figures for average value per acre.

Although the steady upward trend in net farm incomes and the prices of farm products since the low point of the depression period, the fact that foreclosures and other forced liquidations in a number of areas have probably already exerted most of their influence, and the fact that there have been reductions in mortgage rates of interest in a number of areas and an apparent easing of the credit situation elsewhere have tended to stabilize farm land values, there is yet no assurance that the bottom has been reached. While the aggregate value in current dollars of farm real estate as returned by the 1925 Federal census was 42 per cent more than that returned in 1910, in unchanging dollars of a constant purchasing power it was 6 per cent less. The value (in current dollars) of all farm lands with improvements on March 1, 1926, as indicated by the Bureau of Agricultural Economics index, was slightly above that for 1917 and about 25 per cent above the 1912–1914 average. In terms of pre-war dollars, however, it was approximately 20 per cent below the average for 1912–1914. It can not be inferred that land values will readjust themselves to the general price level in the pre-war ratio, as a general price index is not a net farm income index, as is evidenced by the change of the

ratio of farm taxes and of the prices of farm produce; and it is not improbable that land values and income will reach stability in a new relationship, as is evidenced by the change in the ratio of gross cash rent to land value in Iowa, which fell from 7.7 per cent in 1900 to 4.3 per cent in 1910 and to 3.6 per cent in 1920.

The average value per acre for the United States, according to the census, decreased from $69.38 in 1920 to $53.57 in 1925, the changes in average values in the several sections varying from increases of $3.11 and 69 cts. in the New England and Middle Atlantic sections, respectively, to decreases of from 31 cts. to $29.10 in the other sections. According to the Bureau of Agricultural Economics March 1 index, the decreases for the United States were from $107.89 in 1920 to $76.47 in 1926. In the New England, Middle Atlantic, South Atlantic, West South Central, and Pacific sections, the minimum was reached in 1921 to 1925, after which increases of from $1.31 to $3.32 took place by 1926. In the other sections the decreases continued, but at a lower rate. The forced sales—delinquent tax sales, foreclosures, bankruptcy, etc.—for the year ended March 15, 1926, varied from 11.67 per 1,000 in the Middle Atlantic section to 50.2 in the Mountain section, averaging 21.39 for the United States.

Tables are given showing by States the above data as to land values and sales, and maps are included showing by States and by counties the percentages of change in value of farm real estate from the 1920 census to the 1925 agricultural census.

The farm lease in Wisconsin, B. H. HIBBARD and H. HOWE (*Wisconsin Sta. Bul. 391 (1927) pp. 26, figs. 3*).—The advantages and disadvantages of cash and share rent and the important items to be considered by owners and tenants in deciding upon the terms of a lease are described. The amount and character of tenancy, prevailing types of leases, length of tenure, investment of and returns to landowners under different types of leases in different sections of Wisconsin, and the net incomes of tenants are discussed.

Costs of producing sugar beets, II–IX, E. B. BROSSARD ET AL. (*Washington: U. S. Tariff Comn., 1925, pt. 2, pp. VI+68, figs. 6; 1926, pts. 3, pp. VI+68, figs. 6; 4, pp. IX+98, figs. 16; 5, pp. VII+92, figs. 12; 6, pp. VII+84, figs. 10; 7, pp. VI+68, figs. 6; 8, pp. VI+66, figs. 6; 9, pp. VII+88, figs. 12*).—These parts complete the series previously noted (E. S. R., 54, p. 586).

The reports contain a history of the investigation with maps showing the location of the areas investigated; a description of the sugar beet and beet sugar industries and of the method of investigation; copy of schedule used; reservations by Commissioner Costigan; tables, maps, and charts showing the scope and representativeness of the investigation; costs and returns to growers by States, 1921–1923; and cumulation, including and excluding capital charges, at increasing costs per ton, of producing farms, and of acres and tons of sugar beets harvested in 1922 for the 22 areas investigated. The individual reports include tables and charts for the State and the areas in the State studied, showing the relation of the acreage of beets to the net costs in 1922; the costs of production and returns to growers per acre and per ton of sugar beets harvested and per pound of sugar extracted, 1921–1923; the analysis of the average costs of production; cumulation, at increasing costs of production, of producing farms, and of acres and tons of beets harvested, 1922; the labor costs; horse costs; capital and capital charges; farm practices; types of farming on the farms investigated, 1922; and answers to general questions concerning the sugar beet industry.

The States and number of farms covered by the several parts are as follows: Part 2, Ohio, 145 farms; part 3, Nebraska, 200 farms; part 4, Colorado, 585

farms in 5 areas; part 5, Utah, 478 farms in 3 areas; part 6, Idaho, 106 farms in 2 areas; part 7, Wyoming, 78 farms; part 8, Montana, 71 farms; and part 9, California, 103 farms in 3 areas.

Reliability and adequacy of farm-price data, C. F. SARLE (*U. S. Dept. Agr. Bul. 1480 (1927), pp. 66, figs. 14*).—This bulletin gives the history of the collection of farm prices by the Department, describes and analyzes the methods used and the reliability and adequacy of the data, lists the purposes for which such data may be used, and discusses the outstanding advantages and disadvantages of the series for each purpose.

The use of unweighted averages and averages weighted in various ways for farm prices is analyzed, with the result that the present system—constant production weights for States being used month by month—for the United States monthly prices will be continued and the annual United States average price will be computed on the basis of current marketings by months rather than constant or usual marketings. The analysis of the farm-price samples taken by the Department for different crops, livestock, and livestock products shows that the coefficients of variability in most States for cotton, wheat, flax, corn, oats, hogs, veal calves, lambs, butter, butterfat, and eggs are small, especially in surplus-producing States, and that it is practically certain that the average of a much larger sample taken by the same method would not vary more than from 1 to 5 per cent of the present average. In the case of the other farm products, the size of the sample, except in States where an unusually large number of reports are received, is not sufficient to reduce the probable error so that four times the relative probable error is much below 10 per cent of the average price. Generally the December 1 prices of crops and the January 1 values of livestock are more reliable than the monthly prices.

A comparison of the price series in different States for wheat, cotton, and potatoes shows that the movements of prices are generally quite close in different States. A comparison of farm prices with market prices gives the following range of correlation coefficients for different periods of the time considered or for different methods of determining the average monthly prices: Iowa hogs, 1910–1925, from +0.992 to +0.998; Kansas wheat, 1920–1923, +0.990 and +0.984; North Dakota wheat, 1920–1923, +0.987 and +0.984; and Texas cotton, 1910–1925, from +0.957 to +0.991, being +0.989 for the entire period.

Two methods of forecasting hog prices, M. EZEKIEL (*Jour. Amer. Statis. Assoc., 22 (1927), No. 157, pp. 22–30, figs. 3*).—Charts are given and discussed showing estimates (computations made after the event) from July, 1924, to June, 1925, and forecasts (computed before the event) from July, 1925, to May, 1927, using the pre-war formula and "synthetic demand-curve" method previously described (E. S. R., 56, p. 184).

Economic aspects of the cantaloupe industry, E. RAUCHENSTEIN (*California Sta. Bul. 419 (1927), pp. 45, figs. 9*).—The purpose of this study was to analyze the data having a bearing on the cantaloupe industry in the United States, and especially that in the Imperial Valley of California. Statistics are given as to the acreage, production, and the carload shipments by years, 1916–1925, and by months, 1925, for the different States. Increase in acreage, increase in temperature during later years, introduction of new varieties, and the use of brush shelter have resulted in a striking increase in the earliness of ripening of car lots of cantaloupes in the Imperial Valley. Cantaloupe shipments from the valley are at peak in June and meet with no serious competition from other fresh fruits. A correlation coefficient of 0.98 was obtained with the degree of relationship between weighted New York prices and the acreage of cantaloupes in the Imperial Valley the following year. A correla-

tion of weekly averages of carload receipts in New York, maximum temperatures with a 3-day lag, and the time of the season with the average weekly prices in New York for the years 1921–1926 shows that these three factors account for 88 per cent of the variations in the average weekly prices. A formula for estimating prices is given based on estimated purchasing power, 1910–1914; average daily receipts for carload lots in New York; deviations from the average 1921–1926 maximum temperature with 3-day lag; and time in weeks of the season.

Lettuce, H. R. WELLMAN (*Calif. Agr. Col. Ext. Circ. 5 (1926), pp. 51, figs. 26*).—Tables and charts, with explanatory text, are given showing the acreage, production, seasonal movement, distribution, consumption, and prices of Iceberg and Big Boston lettuce in the United States, with special reference to the California industry.

Speculative transactions in the 1926 May wheat future, J. W. T. DUVEL and G. W. HOFFMAN (*U. S. Dept. Agr. Bul. 1479 (1927), pp. 56, pls. 3, figs 6*).—This bulletin carries forward the investigation previously noted (E. S. R., 55, p. 686) to include the transactions in the 1926 May wheat future on the Chicago Board of Trade. It deals mainly with the trading of the eight largest speculators, the only traders whose net position in the May future reached 2,000,000 bu. or over at any one time. Analysis is made from the standpoint of the net position of the eight traders as it relates to price movements. The operations of small traders as illustrated by the amounts of the orders handled at different times during the day of March 1, 1926, by two large commission houses and by the net position of 15 selected clearing firms are discussed.

The study shows that the trading of the eight speculators directly relates to the movements in prices, while futures prices generally move in the opposite direction to the "operations" of the small and medium-sized "general public" trader. The relation of trading to price movements for both classes of traders is true whether within the trading day, from one day to the next, or over a longer period. The volume of purchases or sales in itself does not seem to be an adequate explanation for price movements. The manner of making purchases or sales, rather than mere quantity, seems to be the more important factor. Lack of any natural limit to futures trading growing out of the needs of commerce subjects such trading so often to abuse.

The study confirms and strengthens the conclusions and recommendations presented in the previous report.

Farmers' elevators in North Dakota, A. H. BENTON and M. F. PEIGHTAL (*North Dakota Sta. Bul. 206 (1927), pp. 52, pls. 6, figs. 13*).—The results of a study of the organization and operating methods and an analysis of the incomes and costs of farmers' elevators are given. The study was based upon the records of 223 elevators for the business year ending in the spring or summer of 1924. Four hundred and twenty-two annual audit reports were secured from these elevators for the period 1919–1925. Tables and charts with explanatory text are given of the various phases of organization, including types of organization, membership, dividends, capacity and investment, and trade area and competition; of operating methods; and of analysis of business operations, including incomes, costs, and side lines. The method used in calculating and charting the measures of performance or efficiency factors is explained and illustrated.

The field study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

Roadside marketing for West Virginia farmers, W. W. ARMENTROUT (*West Virginia Sta. Circ. 45 (1927), pp. 11, figs. 6*).—This gives information regarding the locating and operating of roadside markets.

A graphic analysis of the Nation's food industry (*New York: Chandler & Co., 1926, pp. 143, pls. 5, figs. 75*).—Section 1, Food Production and Consumption, considers the following commodities: Meats, milk, wheat flour, sugar, butter, chickens, eggs, wheat, bread, white potatoes, ice cream, coffee, fish, canned vegetables, apples, and canned fruits. Tables are given showing by States the volume and value of production and consumption, and charts showing by States the percentage of total production, consumption, and population of the United States, and for each State the percentage of production and consumption compared with the area and population of the United States.

Section 2, Distribution of Food, consists of portions of the summary of the Joint Commission of Agricultural Inquiry of the Sixty-seventh Congress (E. S. R., 50, p. 491), and includes diagrams showing the agencies, services, operations, etc., in the distribution of all agricultural products, livestock and livestock products, dairy products, wheat and wheat products, and fruits and vegetables, and a table of the geographical location of independent retail and chain grocery stores.

Section 3, Economies Resulting from Consolidation, is a discussion of the possible economies and those effected in a number of corporations and industries by consolidation.

Section 4, Analysis of Retail Food Prices, is based upon a preliminary report of the Bureau of Agricultural Economics, U. S. D. A., and gives analyses of the average retail prices of meat; milk in Washington, D. C., December, 1923; bread from October, 1922, to March, 1923, in New York, Boston, Chicago, Minneapolis, Kansas City, New Orleans, and San Francisco; potatoes in Chicago and Boston, 1922–23; and northwestern Winesap apples in unit grocery stores of New York City.

Section 5 is a financial summary of representative food concerns.

Cooperation in agriculture (*Natl. Assoc. Marketing Off. Proc., 8 (1926), pp. 146, fig. 1*).—The report of the eighth annual meeting of the National Association of Marketing Officials, held at Chicago, November 29 to December 1, 1926. The reports of the committees on transportation, legislation, city marketing, standardization, cooperative organization, sales and consignments, crop and livestock estimates, market reporting, and the special committee on marketing research are given, together with the following addresses: World Production vs. American Production of Agricultural Products, by O. C. Stine; Routes and Rates to World Markets, by W. L. Harding; Dawn of a New Era in Production and Marketing, by W. Parker; Coordinating Production to Market Requirements, by P. L. Miller; Lowering City Distribution Cost for Farm Products, by W. P. Hedden; Chain Store Distribution from Producer to Consumer, by H. Baum; Cooperative Purchasing, by J. D. Zink; Membership Attitudes and Relations, by R. F. Lewis; Objectives of the New Federal Division of Cooperative Marketing, by C. L. Chirstensen; Cooperation in Idaho, by R. L. Spangler; What State Marketing Agencies Have Accomplished in Ten Years, by P. R. Taylor; Some Relations of Government to Agriculture in Europe, by A. R. Mann; The Agricultural Surplus Situation, by W. Hirth; and Stabilization of American Agriculture, by F. O. Lowden.

The report of the special committee on marketing research includes (1) a list of specific projects recommended by departments of agriculture and marketing of the several States to be undertaken by colleges; (2) lists of projects by general groups and by commodities being carried on by colleges; and (3) a list of the research projects being carried on by State departments of agriculture and marketing.

Community organization in Missouri, B. L. HUMMEL (*Missouri Agr. Col. Ext. Circ. 183 (1926), pp. 72, figs. 24*).—A survey of 761 communities in 61 counties in Missouri shows that such communities average 47 square miles in area and include 6 school districts. Trade area, social center, distance from other centers, high school, and roads were the most important of the 14 factors used in determining the size of 144 communities that had been mapped. This publication sets forth the guiding principles and technique in organizing, developing, and carrying on a standard community organization and its adaptation to agricultural extension work. The work of the Missouri standard community associations in 1925 is summarized, and lists are given of the agencies and publications accessible for assistance along different lines of work.

American agricultural villages, E. DES. BRUNNER, G. S. HUGHES, and M. PATTEN (*New York: George H. Doran Co., 1927, pp. XXXV+27-326, figs. 37*).—This volume is the third of a series previously noted (E. S. R., 55, p. 690), embodying the results of the study of American agricultural villages and the open country immediately surrounding. The present study is based upon field work data gathered between May, 1923, and May, 1925, by trained investigators from about 140 agricultural villages with populations ranging from 250 to 2,500 in 28 States, divided into agricultural areas as follows: Hay and pasture 38, corn 31, corn and winter wheat 19, cotton 23, spring wheat 5, Great Plains 4, Rocky Mountain and intermountain plateaus 6, North Pacific 5, and South Pacific 9. The interrelationships of villages and country and the economic, social, and religious life of villages are discussed under the following headings: Agricultural conditions at the time of the study, the structure of the village community, village and country relations, the village as a farm service station, the village public school, the village church, village social organizations, public health in villages, the village as a body politic, and measuring variations in village health.

Appendixes include the following: History and scope of the study, the agricultural setting of the 140 village communities, data regarding churches, finances of small and large municipalities, and indices used in measuring variations in village wealth.

Crop report regulations (*U. S. Dept. Agr., Misc. Circ. 96 (1927), pp. 4; Amend., p. 1*).—The regulations, effective January 1, 1927, governing the publication of reports and the information utilized in the compilation of reports, prepared by the Bureau of Agricultural Economics, concerning acreages, conditions, yields, farm reserves, or quality of products of the soil grown within the United States, are set forth, together with extracts from laws relating to the collection and issuance of crop and livestock reports.

Amendments to the above regulations are given in mimeographed form.

Carload shipments of fruits and vegetables from stations in the United States for the calendar years 1924 and 1925, compiled by M. HALL (*U. S. Dept. Agr., Statis. Bul. 19 (1927), pp. 158*).—Tables are given for different fruits and vegetables showing carload shipments by States, counties, and shipping points during the calendar years 1924 and 1925. This bulletin supplements bulletins previously noted (E. S. R., 53, p. 91).

Stocks of leaf tobacco (*U. S. Bur. of the Census Bul. 159 (1925), pp. 47, fig. 1*).—Statistics are given for the stocks of leaf tobacco held on specific dates from 1912 to 1926; the supply, distribution, production, and consumption of tobacco; quantities of tobacco received from farmers; the imports, exports, and manufacture of tobacco and tobacco products; bonded manufacturing warehouses; and internal revenue collections on tobacco.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A laboratory manual for general biology, R. J. CAMPBELL (*Ann Arbor, Mich.: Edwards Bros., 1926, pp. [4]+34*).—This is a mimeographed manual for a college course in general biology.

Elements of tropical agrculture, J. DÁVILA ACOSTA and M. E. MELO (*Elementos de Agricultura Tropical. Panama: "La Union," 1924, pp. XXIV+338 +4, figs. 193*).—This is the official text for elementary schools of the Republic of Panama and covers soils, botany, tillage, cultivation of individual crops, and farm animals.

South America, E. W. SHANAHAN (*London: Methuen & Co., 1927, pp. XIV+318, figs. 50*).—This is a text for university students, covering by regions the geographical features, resources, industries, and general economic life of South America.

Corn and corn-growing, H. A. WALLACE and E. N. BRESSMAN (*Des Moines, Iowa: Wallace Pub. Co., 1925, rev. ed., pp. [4]+274, figs. 95*).—A revision of text previously noted (E. S. R., 50, p. 694).

Laboratory recipes, H. FOLGER (*Boston: Young Women's Christian Assoc., School Dom. Sci., 1926, pp. 229*).—This is a book of recipes and a laboratory manual prepared for use in the foods courses in the School of Domestic Science of the Boston Young Women's Christian Association.

FOODS—HUMAN NUTRITION

Index to reports on food products and drugs, 1915–1925, E. M. BAILEY (*Connecticut State Sta. Bul. 284 (1927), pp. 111–155*).—The general plan of the earlier index (E. S. R., 34, p. 458) has been followed in this index, covering the period 1915 to 1925, inclusive, and representing the examination of about 23,000 samples of food and drugs.

The drying of vegetables, A. W. KNAPP (*Jour. Soc. Chem. Indus., 45 (1926), No. 19, pp. 123 T–128 T*).—A general discussion of the methods of drying vegetables, based upon the author's experience in a vegetable drying factory in operation in England during the war.

Continuation and extension of work on vegetable proteins, T. B. OSBORNE and L. B. MENDEL (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 391–397*).—This is the annual progress report (E. S. R., 55, p. 189) of the work of the authors and their associates on various nutritional problems, including the relation of the rate of growth to diet (E. S. R., 56, p. 191), physiological effects of diets high in protein (see below), the relation of diet to reproduction, and the chemical constitution of the simpler constituents of plant cells such as yeast (E. S. R., 56, p. 9).

Physiological effects of diets unusually rich in protein or inorganic salts, T. B. OSBORNE, L. B. MENDEL, E. A. PARK, and M. C. WINTERNITZ (*Jour. Biol. Chem., 71 (1927), No. 2, pp. 317–350, pl. 1*).—Previous studies by Osborne and Mendel (E. S. R., 51, p. 557) and other investigators on the general problem of the effect of high protein diets on various physiological functions are reviewed, and a further investigation of the problem is reported confirming the previous observations that rats are capable of growing to adult size at an essentially normal rate on diets extremely rich in protein. In some of the successful experiments the protein (casein or meat residue) constituted two-thirds or more of the entire caloric intake. The failure of various investigators to secure equally good growth on high protein diets is thought to be due to possible inadequacy in the vitamin content of the rations. It has also been

demonstrated that animals raised to large size on fairly low protein diets can become adjusted to the protein-rich diets. The blood of the rats on a protein-rich diet was somewhat higher than that of rats on an ordinary laboratory diet in nonprotein nitrogen and much higher in urea nitrogen. The urine had a much higher content of urea but showed no evidence of kidney disturbance. As noted in earlier studies, hypertrophy of the kidney was a characteristic outcome of the high protein diet, the change taking place very rapidly and with all the proteins tested. Ingestion of considerable amounts of urea or of inorganic salts normally excreted by the kidneys failed to bring about any renal enlargement.

The protein value in nutrition of beef liver, beef heart, and beef kidney, H. H. Mitchell and J. R. Beadles (*Jour. Biol. Chem., 71 (1927), No. 2, pp. 429–435*).—Supplementing previous studies of the protein value of various foods (E. S. R., 56, p. 491), data are reported on the protein values of beef heart, kidney, and liver fed at an 8 per cent level.

The average biological values found were 74 for beef heart and 77 for kidney and liver. It is pointed out that these values are equal to or slightly higher than the values obtained in other experiments for muscle meats, but less than those obtained for milk proteins. At a 16 per cent level the protein of liver was found to have a distinctly lower biological value than at an 8 per cent level. "This is but another confirmation of the conclusion deduced from earlier experiments to the effect that the utilization of protein (nitrogen) in anabolism varies inversely with the level at which it is fed, as measured by the percentage of nitrogen in the ration."

The effect of heat and oxidation on the nutritive value of a protein, H. Goldblatt and A. R. Moritz (*Jour. Biol. Chem., 72 (1927), No. 1, pp. 321–326*).—To determine whether the combined heating and oxidation method employed in many nutrition laboratories to destroy vitamin A in the constituents of basal diets has any harmful effect on their nutritive value, two groups of young rats were fed supposedly adequate diets containing 20 per cent of casein previously heated in one case at 105 to 110° C. and in the other between 125 and 130° in thin layers on large trays for three periods of 12 hours each.

The growth of the rats in both groups exceeded Donaldson's growth curves for the corresponding sex and with but little variation between the two groups, indicating that no harmful action had taken place.

Synthesis of amino acids in the animal body.—IV, Synthesis of histidine, B. Harrow and C. P. Sherwin (*Jour. Biol. Chem., 70 (1926), No. 3, pp. 683–695, figs. 4*).—In this continuation of the studies previously noted (E. S. R., 51, p. 862), the authors have confirmed the results reported by Rose and Cox (E. S. R., 52, p. 859), showing that growth is possible on diets in which the sole source of nitrogen is the amino acids obtained by hydrolysis of a protein. They have shown further that a diet from which all traces of histidine have been removed, together with as much of the arginine as is possible by present methods, may be markedly improved by the addition of histidine or of imidazol lactic acid, a compound closely related to histidine and a possible intermediary compound in the metabolism of histidine in the body. Imidazol pyruvic acid and imidazol acrylic acid were less efficient, and imidazol alone was of no value as a substitute for histidine. The probable metabolism of histidine in the body is discussed.

Glutathione content of normal animals, J. W. Thompson and C. Voegtlin (*Jour. Biol. Chem., 70 (1926), No. 3, pp. 793–800*).—The method of determining glutathione described by Tunnicliffe (E. S. R., 54, p. 9) has been shown to be reliable and accurate for use with animal tissues. An application of the

method to the analysis of large numbers of normal rats from the embryo stage to maturity has shown that the total glutathione content of the body decreases with increasing age. The liver was found to contain the highest proportion of the glutathione followed by the kidney, brain, and muscle, the latter containing very little. It was demonstrated that blood serum is free from glutathione, but that blood corpuscles contain it. More than 90 per cent of the glutathione is present in the SH form.

Lipid excretion.—IV, A study of the relationship of the bile to the fecal lipids with special reference to certain problems of sterol metabolism, W. M. Sperry (*Jour. Biol. Chem., 71* (*1927*), *No. 2, pp. 351–378*).—In this continuation of the series of studies on lipid excretion (E. S. R., 55, p. 693), the elimination of lipids in normally controlled dogs on a lipid-free diet was compared with that of dogs in which fistulas had been made to prevent any bile from reaching the intestines.

The total lipid in the feces of the bile-fistula dogs was from 1½ to 4½ times greater than in the control animals, although the ratio of sterols to total lipids was markedly constant. These results suggest that the bile is not the chief source of fecal lipids. Various hypotheses are suggested to explain the increased secretion of lipids in the absence of bile.

Studies of the metabolism of women.—III, Variations in the lipid content of blood in relation to the menstrual cycle, R. Okey and R. E. Boyden (*Jour. Biol. Chem., 72* (*1927*), *No. 1, pp. 261–281, fig. 1*).—This continuation of the studies previously noted (E. S. R., 56, p. 193) deals with the lipid content of over 200 before-breakfast blood samples covering 26 monthly cycles in 16 women, 2 on weighed and constant diets and the rest on ordinary college boarding-house fare.

There appeared to be a striking and consistent cyclic alteration in the blood cholesterol, the values falling during or within a few days of the menstrual period and then rising to values above normal. This rise and fall was not accompanied consistently by similar changes in the blood, fatty acid, and lecithin. The values for lecithin were more nearly constant than for either the fatty acids or cholesterol.

On the nature of the urine sugars, H. S. Eagle (*Jour. Biol. Chem., 71* (*1927*), *No. 2, pp. 481–495*).—Following a brief review of the literature on urine sugars, the author presents evidence from which he concludes that it is doubtful whether the normal individual on an average diet ever shows true glucose in the urine.

The evidence consisted (1) in the demonstration that glucose when added to urine in amounts up to 0.4 per cent may be quantitatively fermented within 40 minutes by incubating at 37 to 38° C. with appropriate quantities of yeast, provided certain substances in the urine which tend to obscure the results of fermentation are first removed by Lloyd's alkaloidal reagent and (2) in testing the urine for sugar after the ingestion of various amounts of glucose. In testing for glucose, Benedict's copper tungstate reagents were used (E. S. R., 54, p. 10).

It was found that only when such large quantities as 100 gm. of glucose were taken were fermentable sugars present in the urine. It is thought that the increase in urine sugar following food and glucose intake reported by Benedict and named glycuresis (E. S. R., 39, p. 874) represents not glucose but nonfermentable substances.

Effect of a diet low in calcium on fertility, pregnancy, and lactation in the rat, D. Macomber (*Jour. Amer. Med. Assoc., 88* (*1927*), *No. 1, pp. 6–13, figs. 12*).—In this paper, which is noted in detail on page 65, and in a supple-

mentary discussion the importance is emphasized of an abundance of calcium in the diet of pregnant and nursing women, and it is pointed out that if the diet is inadequate in this respect it is the mother and not as a general rule the child who is affected during pregnancy and the child during lactation. Milk and milk products are considered to be the best source of calcium for the mother during pregnancy and lactation, with eggs and vegetables as a secondary source.

Iron in nutrition.—III, The effects of diet on the iron content of milk, C. A. ELVEHJEM, R. C. HERRIN, and E. B. HART (*Jour. Biol. Chem., 71 (1927), No. 2, pp. 255–262*).—In this study use has been made of the delicate method of determining iron described in the previous paper of the series (E. S. R., 55, p. 614) in an attempt to detect an increase in the iron content of milk resulting from an increase of iron in the ration. The studies included several on goats, using ferric oxide and green cabbage, and ferrous sulfate as the sources of iron in amounts furnishing about five times that of the basal ration. Analyses were also made of the milk of cows on various rations furnishing different amounts of iron. Although the iron content of the milk varied with the individual, neither cow's milk nor goat's milk was affected by changes in the iron content of the food. A further proof that milk from goats receiving large amounts of iron is no richer in its iron content than ordinary goat's milk was furnished by the failure of the former to cure nutritional anemia in rabbits.

It is concluded that the "percentage of iron in the milk seems to be an established amount for any specific animal and can not be varied even by drastic changes in the iron content of its diet."

A biochemical study of tooth growth, Y. MATSUDA (*Jour. Biol. Chem., 71 (1927), No. 2, pp. 437–444, fig. 1*).—Supplementing the previously reported studies of Hammett on bone growth (E. S. R., 55, p. 491), the author has determined by the same method the content of water, ash, organic matter, calcium, phosphorus, and magnesium of the upper and lower incisors of male rats at 23, 30, 50, 65, 75, 100, and 150 days of age.

The lower incisors were consistently heavier than the upper and contained higher percentages of ash, calcium, and phosphorus. In general the percentages of ash and its constituents in the whole teeth increased with age, that of water decreased, and of organic matter ran an undetermined course. The calcium and phosphorus percentage of the ash showed no progressive change with age, but that of the magnesium tended to increase. Puberty caused alterations in these changes, chiefly a decrease in the percentage of ash constituents and an increase in water.

Recent progress in vitamin research, S. L. SMITH (*Jour. Home Econ., 19 (1927), No. 4, pp. 189–197*).—A summary of the more important vitamin literature appearing in 1926, with a list of 39 references.

Vitamins in heat-sterilised food, C. M. DUGDALE and R. J. MUNRO (*Jour. Soc. Chem. Indus., 45 (1926), No. 21, pp. 135 T–140 T, figs. 6*).—The literature on the effect of heat sterilization upon the vitamin content of certain foods is reviewed, and a few experiments are reported in which canned minced meat and meat soup were tested for their content of vitamins A and B, using the technique of Drummond. As compared with growth on a full mixed diet or a complete artificial diet, normal growth was secured in rats on 3 and 5 gm. daily of the minced meat or 10 gm. of the meat soup as the sole source of vitamin A. For vitamin B the minimum quantity of minced meat needed daily was found to be about 7 gm. and of soup from 5 to 10 gm.

The effect of irradiation on vitamin A, S. G. WILLIMOTT and F. WOKES (*Pharm. Jour. and Pharm. [London], 4. ser., 64 (1927), No. 3304, pp. 217, 218*).—

In this quantitative study of the destructive effect of irradiation on vitamin A, 50 cc. of cod-liver oil known to be a potent source of vitamin A was exposed to a quartz mercury vapor lamp in an open evaporating dish at a distance of 3 in., and at intervals of 5 minutes 2 or 3 cc. of the oil was transferred to bottles of nonactinic glass, kept away from the light, and tested as soon as possible by both the antimony trichloride and arsenic trichloride color tests.

Both of these became negative at the end of 2 hours' exposure. A further comparison in the Lovibond tintometer gave parallel results. In this test 0.2 cc. of the oil in chloroform (20 per cent by volume) and 2 cc. of antimony trichloride solution (about 30 per cent in anhydrous chloroform) were used, and 0.1 cc. of the oil with 2 cc. of pure arsenic trichloride, the end point being taken as that at which no blue color could be observed.

It was also found that in a sample of cod-liver oil exposed for even a few minutes only to ultra-violet light continuous destruction of vitamin A proceeds.

It is concluded that an exposure of ultra-violet light sufficient to produce a reasonable amount of vitamin D may be expected to bring about a destruction of vitamin A amounting to between 5 and 10 per cent 3 months after irradiation. "This is not a serious loss, and probably could not be detected by animal experiment. Nevertheless, it ought not to be ignored, especially as it apparently continues increasing month after month and at the end of a year may have reached a considerable amount."

Effect of ultraviolet light on oxygen consumption and on total metabolism, E. H. and H. H. MASON (*Arch. Int. Med., 39 (1927), No. 3, pp. 317–329, figs. 10*).—The effect of maximum exposure to ultra-violet light upon metabolism was studied in 10 hospital patients suffering from various diseases.

In 8 cases there was a marked lowering of heat production, accompanied by a slowing of the pulse rate. The effect was most marked in 3 subjects in whom there was an increased amount of bilirubin circulating in the blood stream. One subject whose metabolism had failed to decrease after 12 light exposures and the development of extreme pigmentation was given a high buckwheat diet. On continuing the irradiation a lowering of the metabolism resulted, the maximum effect being produced on the twenty-fifth day after the buckwheat diet had been started and after 8 light exposures had been given.

Light treatment at an infant welfare centre, A. G. HAMILTON (*Pub. Health [London], 40 (1927), No. 5, pp. 144–149*).—This is a summary and discussion of the results obtained in the first year's operation of a light clinic at the Royal College of St. Katharine, Poplar, England, during which time 209 children from 3 months to 5 years of age were given a total of 3,935 treatments with combination carbon arc and mercury vapor lamps.

Among the observations noted as a result of the treatment were an increase in muscular power and activity in almost every case, definite improvement in rachitic condition except in cases complicated by diseased tonsils and adenoids, and no striking increase in weight. In the experience of the author out-of-door sun treatment results in greater improvement than artificial light treatment.

Cod liver oil concentrate: Its value as an antirachitic agent when injected subcutaneously, B. and S. D. KRAMER, D. H. SHELLING, and M. J. SHEAR (*Jour. Biol. Chem., 71 (1927), No. 3, pp. 699–706*).—The conflicting evidence on the potency of cod-liver oil as an antirachitic agent when injected subcutaneously is reviewed, and data are presented to show that a cod-liver oil concentrate injected subcutaneously in an ether solution is capable of curing experimental rickets in rats but is ineffective when injected subcutaneously in palmitin as the solvent. The nonsaponifiable fraction of the oil was

prepared by the method described by Dubin and Funk (E. S. R., 53, p. 765) and concentrated further by the method of Drummond, Channon, and Coward (E. S. R., 55, p. 711).

The vitamin B content of some Philippine fruits and vegetables, II, F. O. and S. Santos (*Philippine Jour. Sci., 30 (1926), No. 3, pp. 307–323, figs. 3*).—In this continuation of the work begun by Acuña (E. S. R., 51, p. 666), the native vegetables paco (*Diplazium esculentum*), balunsay (*Celosia argentea*), and uray babae (*Amaranthus viridis*) were tested for their content of vitamin B by feeding to young rats 1 gm. of the dried material or the alcoholic extract of 2 gm. as a supplement to a basal vitamin B-free diet. As far as can be judged by the small number of animals used (not more than 5 for each material), paco and uray babae contained negligible amounts of vitamin B and balunsay a very small amount. Proximate analyses of the foods tested are included.

The vitamin B content of some Philippine fruits and vegetables, III, F. de Jesus (*Philippine Agr., 15 (1927), No. 9, pp. 533–546, figs. 4*).—In continuation of the above study, the edible portion of the ripe fruits of mabolo (*Diospyros discolor*) and santol (*Sandoricum koetjape*) and the roots of sincamas (*Pachyrrhizus erosus*) and poñgapong (*Amorphophallus campanulatus*) were dried in the sun, ground to a fine powder, and fed separately in 1- and 2-gm. amounts to rats on a vitamin B-free diet. As thus tested, mabolo and poñgapong proved to be deficient in vitamin B, 2 gm. daily of the dry material being insufficient to check loss in weight. Santol contained a small amount of vitamin B, as the rats were able to maintain their weight on a daily supplement of 2 gm. of the dried material. One gm. daily of dried sincamas brought about recovery and renewed growth, showing it to be a fairly good source of vitamin B. Proximate analyses of the foods tested are included.

Relation between the vitamin C content of a cow's ration and the vitamin C content of its milk, J. S. Hughes, J. B. Fitch, H. W. Cave, and W. H. Riddell (*Jour. Biol. Chem., 71 (1927), No. 2, pp. 309–316, figs. 3*).—Contrary to various reports in the literature, evidence is presented in this paper that the vitamin C content of a cow's ration has little if any influence on the vitamin C content of its milk. The study was a part of a general investigation in which vitamins A and B were also tested. These were shown to be present in the milk in proportion to their content in the diet, but no evidence was obtained of a similar relationship for vitamin C. The particular phase of the investigation reported in this paper was the relative vitamin C content of the milk of cows on pasture and thus receiving green feed and sunshine and of cows stall-fed on a grain mixture, alfalfa hay, and silage, with no green feed. To eliminate vitamin D as a factor in the milk of the pasture-fed cows, the guinea pigs used for the experiment were given cod-liver oil daily to the extent of 1 per cent of the ration. No differences could be detected in the vitamin C content of the milk when fed to the extent of 30 cc. daily as a supplement to a scurvy-producing ration.

Spontaneous infections of guinea-pigs: Pneumococcus, Friedländer bacillus, and pseudotuberculosis (Eberthella caviae), A. Branch (*Jour. Infect. Diseases, 40 (1927), No. 4, pp. 533–548, figs. 3*).—This paper should be of interest to those who have experienced difficulties in raising guinea pigs for vitamin C studies. The observations reported were made at the Trudeau Sanatorium from February to June, 1926, on a colony of about 400 guinea pigs, half of which had been bred on the premises and the others obtained from dealers. In the course of an epidemic occurring in this colony 114 animals died, of which 56 proved to be infected with the Friedländer bacillus, 36 with

the pneumococcus, 5 with *Bacillus bronchisepticus*, 3 with streptococcus, and 3 with organisms of the Eberthella group. In the remainder the cause of death was undetermined.

The frequency of botulism.—Report of outbreaks for 1926 (*Jour. Amer. Med. Assoc., 88 (1927), No. 17, p. 1321*).—This yearly report (E. S. R., 55, p. 391) is encouraging in that only four outbreaks of botulism, three in the United States and one in South America, have been reported in 1926. All of the outbreaks were due to home canned foods—fish in Oregon, asparagus in California, and string beans in Wyoming and Buenos Aires. The Oregon outbreak involving three persons, with one death, and the Buenos Aires outbreak involving eight persons, with seven deaths, were the only ones in which laboratory examinations were made. In the former case negative results were obtained, and the diagnosis of botulism is considered doubtful. In the latter the laboratory examination was positive.

TEXTILES AND CLOTHING

Fibres, textiles, cellulose, and paper, D. J. NORMAN (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 11 (1926), pp. 117–148*).—Technical research on the above topics in 1926 is reviewed as heretofore (E. S. R., 56, p. 193).

Wool and its elaboration [trans. title], H. MARK (*Einzeldarstell. Kaiser Wilhelm Inst. Faserstoffchem., No. 1 (1925), pp. VIII+146, figs. 74*).—Methods are outlined, with appropriate examples, for studying the geometrical, mechanical, and chemical characters of the wool fiber and the alteration of the wool fiber by mechanical and chemical factors; the response of fiber masses to compression, extensibility of yarn, and chemical determination of damage in staple; mechanical characteristics of yarn, technical significance of the extension curve, and its alteration by chemical factors; and characterizing a fabric by means of constants and determining the effect of chemical and mechanical factors on fabrics.

The action of formaldehyde on wool, H. S. BELL (*Jour. Soc. Dyers and Colourists, 43 (1927), No. 3, pp. 76–79, fig. 1*).—Experiments at the University College, Nottingham, England, made on knitted woolen web gave evidence that the amount of formaldehyde taken up by wool varies with the concentration of the solution and also with the volume of the bath. After 30 minutes' treatment no increase occurred in the amount taken up. With concentrations above 3 per cent formaldehyde on the weight of wool the quantity taken up attained a maximum which remained practically unchanged by further increase in concentration. Data seemed to indicate that absorption occurs and that a relatively large amount of the absorbed formaldehyde is retained after drying. Of this, part is loosely fixed or adsorbed, and approximately an equal quantity is held more tenaciously or combined, possibly due to reaction with the amino group of the wool or the formation of other complexes.

Spinning qualities of some cottons grown in the South Atlantic States, H. H. WILLIS (*Cotton, 91 (1927), No. 7, pp. 621–624, figs. 4*).—Spinning tests of North Carolina and South Carolina cotton by the U. S. Department of Agriculture cooperating with Clemson College are described in a discussion of factors influencing spinning quality. Results of the various manufacturing tests on South Atlantic cottons and cotton from elsewhere in the Cotton Belt indicate that the use of mongrel or mixed cotton of irregular staple increases waste, causes high end breakage in spinning, and produces yarn irregular in diameter and strength, whereas many pure strains of cotton are uniform in fiber length and strength, possess good spinning quality, and produce yarn of

high breaking strength. Preliminary studies on cotton samples ranging from 1⅛ to 1¼ in. in staple spun into 28's yarn indicated that fiber length accounts for 61 per cent and fiber strength for 11 per cent, respectively, of the yarn strength.

The occurrence of branched lint hairs in Egyptian cotton, N. W. BARRITT (*Nature [London], 119 (1927), No. 2998, p. 392, figs. 3*).—Lateral protuberances observed on fibers of Sakellaridis cotton are being studied further for their textile bearing and extent of occurrence.

Report on the cotton spinning and weaving industry in Japan, 1925–26, W. B. CUNNINGHAM (*London: [Gt. Brit.] Dept. Overseas Trade, 1927, pp. 108*).—An account is given of the history and status of the cotton industry in Japan, with information on spinning companies, the commercial movement of raw cotton, yarn, and fabrics, the types of products, production costs, mill conditions, and other factors in the industry. Considerable statistical data are included.

An examination of the process of sizing cotton yarns on an experimental tape frame, F. D. FARROW and E. H. JONES (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 22, pp. 275–298, pls. 2, figs. 10*).—The present paper gives an account of an investigation concerned with the influence of twist, counts, and character of lint on the compactness and behavior during sizing of single cotton yarns and the effect on the nature of the process of the physical conditions under which size is applied.

The uniformity of heavy sizing in mill practice, S M. NEALE (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 5 (1926), No. 23, pp. 299–302, pls. 2*).—The experiments reported dealt with the causes of variations in size concentration and the effect of size concentration on weighting.

The identification of the rayons, C. E. MULLIN (*Amer. Dyestuff Rptr., 16 (1927), No. 4, pp. 145–152*).—The various properties of the different rayons are discussed and compared, and tests used in identifying them are outlined, special reference being made to acetate silk.

The rayon industry, M. H. AVRAM (*New York: D. Van Nostrand Co., 1927, pp. XXI+622, pl. 1, figs. 170*).—This volume, a comprehensive outline of the rayon industry, traces its history and development, indicates its financial, economic, and engineering status, shows the current production of rayon, and cites rayon patents. From the technological viewpoint, the common textile fibers of commerce and their characteristics are described and the principles of rayon making, raw materials, and the four processes are illustrated and discussed in detail. Chapters are devoted to testing and to processing. The appendix includes useful tables, an extensive bibliography, textile books and periodicals, and a list of rayon producers.

Dry-cleaning rayon (*Natl. Assoc. Cotton Manfrs. Bul. 74 (1926), pp. 2, 3*).—A series of experiments were made on the dry cleaning of fabrics containing rayon and other synthetic fibers as filling on cotton warp. The slight changes noted in certain of the fabrics were so small as to be due to variation in the samples. It was concluded from the data obtained that dry cleaning, properly carried out, had no appreciable effect on any of the common synthetic fibers. The details of the process are given.

Removing stains from cellulose acetate rayons, M. H. GOLDMAN and C. C. HUBBARD (*Amer. Dyestuff Rptr., 16 (1925), No. 6, pp. 237–239*).—Cellulose acetate rayon, an unregenerated cellulose sold on the market as celanese, is difficult to clean when stained because many of the common spotting agents will injure or dissolve the fiber. In the procedure recommended, an unexposed portion of the garment is tested with acetone or glacial acetic acid, instant dissolution indicating cellulose acetate rayon. The stain is then spotted with

a 1:1 solution of the necessary reagent and glycerine and rinsed or sponged with water until the spotting agent is removed.

Bleaching, dyeing, printing, and finishing, A. J. HALL (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 11 (1926), pp. 144–166*).—This review for 1926 is similar in scope to that for 1925 (E. S. R., 56, p. 194).

Fabrics and how to know them, G. G. DENNY (*Philadelphia and London: J. B. Lippincott Co., 1926, 2. ed., rev. and reset, pp. 152, figs. 55*).—A revision and enlargement of the book noted earlier (E. S. R., 54, p. 697).

HOME MANAGEMENT AND EQUIPMENT

Successful family life on the moderate income, M. H. ABEL (*Philadelphia and London: J. B. Lippincott Co., 1927, 2. ed., rev., pp. XII+253*).—This is a second, revised edition of a text previously noted (E. S. R., 46, p. 792) and brings figures and estimates up to date.

Household refrigeration, H. B. HULL (*Chicago: Nickerson & Collins Co., 1926, 2. ed., enl., pp. 389, figs. 135*).—This is the second edition of this book, dealing with the principles, types, construction, and operation of both ice and mechanically cooled domestic refrigerators and the use of ice and refrigeration in the home. It contains chapters on refrigeration units and theory, ice for refrigeration purposes, refrigerants, heat transfer, refrigerating systems, household refrigerating machines (compression and absorption types), household refrigerators, operation of ice refrigerators, testing of ice refrigerators, preservation of foods in the home, and miscellaneous tables.

MISCELLANEOUS

Forty-sixth Annual Report of the New Jersey State Agricultural Experiment Station and the Thirty-eighth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1925, J. G. LIPMAN ET AL. (*New Jersey Stas. Rpt. 1925, pp. XXVII+507, figs. 48*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1925, a report of the director on the work and publications of the year, and departmental reports, the experimental features of which, not previously reported, are for the most part abstracted elsewhere in this issue.

NOTES

Arkansas University and Station.—The new agricultural building was dedicated June 6.

Because of a shortage of funds for extension work, publication of *The Extension Cooperator*, established in 1919, has been discontinued.

Dr. W. E. Loomis, assistant professor of horticulture and assistant horticulturist in the station, has resigned to become associate professor of botany in the Iowa College, beginning July 1.

California University and Station.—Dr. W. L. Howard, director of the Davis Branch of the College of Agriculture, has been appointed associate dean of the College of Agriculture to assist in the administration of the college during the temporary and partial absence of Dean E. D. Merrill, who as previously noted has accepted the directorship of the California Botanical Garden at Los Angeles. B. A. Madson, assistant professor of agronomy and associate agronomist, has been appointed head of the division of agronomy.

Connecticut College and Storrs Station.—Appropriations aggregating $1,316,542 for the ensuing biennium have been made by the General Assembly, of which $475,000 is for resident instruction, $160,000 for extension work, and $70,000 for the station, these amounts being larger by $45,000 than for the previous biennium. There were also granted $420,000 for a classroom building, $28,000 for a pathological laboratory for the station, $19,920 for equipping the fruit storage building, $47,622 for enlarging the filter beds of the college water supply, and $96,000 for extending the work of the county farm bureaus.

Georgia Station.—Marion A. Willis has resigned as assistant agronomist, effective May 15, and has been succeeded by G. A. Hale.

Idaho University and Station.—E. J. Iddings, dean of the College of Agriculture and director of the station and extension division, has been granted leave for six months and sailed May 26 from New York City on a trip around the world. During this trip it is expected that he will study the agriculture of various foreign countries, with special emphasis on animal husbandry.

Dr. Charles W. Hungerford has been appointed acting dean and director, with J. H. Rearden, county agent leader, as acting assistant director of extension.

Maine University and Station.—At the fifty-sixth annual commencement of the university, J. M. Bartlett received the honorary degree of doctor of science in recognition of his 42 years' continuous service as chemist. The early part of this long period was rendered as chemist of the Maine Fertilizer Control and Agricultural Experiment Station and the remainder as chemist of the station as reorganized under the Hatch Act.

Maryland University.—At the recent commencement the honorary degree of doctor of science was conferred upon Sir John Russell, director of the Rothamsted Experimental Station.

Dr. P. W. Zimmerman, associate dean of the College of Agriculture and botanist and plant propagator in the station, has resigned to accept an appoint-

ment as plant physiologist of the Boyce Thompson Institute of Plant Research beginning September 1.

Massachusetts College and Station.—Dr. R. W. Thatcher, director of the New York State Station and director of research at the College of Agriculture of Cornell University, has accepted the presidency of the college, beginning September 1.

Lewell S. Walker, for 21 years connected with the chemical work of the station, has resigned, effective May 14, to become chief chemist in charge of commercial feeding stuffs and fertilizers at the Vermont Station.

Minnesota University and Station.—The legislature at its last session reestablished the $4,000 appropriation for the Minnesota Crop Improvement Association. This fund is used chiefly in the distribution, inspection, and certification of improved seeds developed at the station. The association is organized for the purpose of protecting these improved varieties and maintaining suitable stocks for seed purposes.

The soils division held a visiting day at the Coon Creek Sand and Peat Experiment Farm on June 7, at which about 350 farmers from surrounding territory were in attendance. The division has succeeded beyond expectations in establishing alfalfa as a profitable crop on sandy lands in Anoka County and at other points in the State. Extensive tests of the effect of manures and fertilizers and of various inoculants have shown that while an application of lime in some form has proved highly beneficial in most cases, successful stands and satisfactory yields may be obtained on many of the sandy soils without it, provided soil from a well inoculated field is applied at the rate of 2 tons per acre. The visiting day was arranged primarily to observe the results obtained with this soil treatment. When lime is used, the form in which it is applied does not seem to be important. Successful stands have been secured following applications of finely ground raw limestone, marl, and hydrated lime. The most practical application seems to be about 2 tons of finely ground raw limestone some months previous to sowing the alfalfa seed. For best results the limestone should be thoroughly incorporated with the soil. Farmers in attendance at the meeting were greatly impressed by the conversion of what had been barren submarginal land into thrifty alfalfa fields, and it is thought that the results of these trials may bring about extensive changes in the agriculture of the sandy lands of the State.

Dr. H. B. Sprague, assistant professor of farm crops and assistant agronomist, has resigned to become head of the department of agronomy at the New Jersey College and Stations, beginning July 1.

New Mexico University and Station.—The honorary degree of doctor of agriculture was conferred by the college upon Director F. Garcia at the recent commencement in recognition of his 32 years of service at the institution.

Cornell University.—George A. Works, professor of rural education in the College of Agriculture since 1914, has resigned, effective July 1, to become dean of the newly established Graduate Library School of the University of Chicago. This school, endowed by a gift of $1,000,000 from the Carnegie Corporation, is unique in that it does not concern itself with technical teaching but with research in college and public library questions. Only those students are to be accepted who have had practical library experience, as well as a bachelor's degree.

Professor Works will be succeeded as head of the department of rural education by Dr. Paul J. Kruse.

Oregon College.—The new women's building erected at a cost of $325,000 was dedicated May 7.

A poultry building is to be erected on the college farm. Its dimensions will be 54 by 126 ft., three stories high, and it will accommodate the poultry and veterinary departments. The ground floor will house an incubator room, a fattening, killing, and judging room, and a class laboratory. A part of the second floor will be devoted to work in poultry diseases, for the enlargement of which the legislature has made special provision. The third floor will be used by the veterinary department. A cold storage plant and research laboratories will be included in the building.

A department of engineering graduate study and an engineering experiment station have been established under the direction of G. A. Covell as dean and director. S. H. Graf has been appointed associate director of the station.

A "dairy profits special," the first demonstration train sponsored by the college in 14 years, was sent out in cooperation with the Union Pacific Railway throughout eastern and central Oregon this spring. The attendance exceeded 9,000.

Pennsylvania College and Station.—An Institute of Chemistry, similar to the well-known Institute of Politics at Williamstown, Mass., will be held at the college from July 4 to 29. Among the subjects to be taken up in the 22 conferences which are scheduled are the training of research chemists, ammonia synthesis and oxidation, spectrophotometry, chemical microscopy, oxidation reduction in the living cells, general status and problems of nutrition, vitamins, and biochemistry.

The resignations are noted of C. L. Goodling, associate professor of farm management and superintendent of farms, effective June 1; L. M. Marble, professor of storage research, J. B. Park, instructor in agricultural education, and A. R. Judd, assistant in botany, effective June 30; E. Grant Lantz, instructor in farm machinery, effective July 13; R. H. Bell, professor of agricultural extension, effective July 15; and J. C. Taylor, assistant professor of poultry husbandry extension, effective August 1.

Porto Rico Station.—On May 26 the station was visited by a group of about 80 farmers brought by the agricultural agent from Lares, a town some 40 miles away. As the visitors were for the most part coffee growers, they were first given a talk on the results of some fertilizer experiments with coffee conducted by the station, and the cost and net profits from suitable fertilization were discussed. They were later shown fertilizer plats in the field and various imported varieties of both coffee and trees for shading coffee, and seed of the latter were given them. As a side line of interest to coffee growers, the station dairy herd was inspected, including imported Guernseys and Shorthorns and crosses of these with native cattle, and the dairy was visited and locally made cheeses were shown.

Considerable curiosity was aroused by a display of toads, *Bufo marinus*, imported from Barbados by this station several years ago as a means of combating injurious insects. The way in which these benefit agriculture was explained. In certain sections these toads have already become very numerous, and they are rapidly being distributed throughout the island.

Imperial College of Tropical Agriculture.—According to a note in *Science*, funds have been granted by the British Empire Marketing Board for research at the college on the Panama disease of bananas, with a view to producing an immune variety. A quarantine station is to be set up at Kew, where rootstocks imported from other countries can be grown and from which offsets certified free from disease will be sent out to the college.

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EXPERIMENT STATION RECORD

VOL. 57 AUGUST, 1927 No. 2

The truism that science knows no national boundaries was demonstrated anew at the First International Congress of Soil Science, held in Washington, D. C., from June 13 to 22, 1927. With a registration of over 500 members drawn from nearly every nation of agricultural importance, this congress demonstrated in an impressive way the common interest of mankind in matters pertaining to the soil, "the one absolutely essential heritage of humanity."

Though termed the first international congress, the gathering was in reality the fifth at which soil scientists of a number of countries had been brought together. Earlier meetings had been held at Budapest in 1909, at Stockholm a year later, at Prague in 1922, and at Rome in 1924. At the last named of these conferences the scope of the undertaking was materially enlarged, and organization on a world-wide basis was projected. For the first time a meeting place in the Western Hemisphere was selected, and to the United States was given the honor of serving as host on this important occasion.

The congress was sponsored by the International Society of Soil Science, headed by Dr. J. G. Lipman of New Jersey and with Dr. D. J. Hissink of the Netherlands as general secretary. The immediate arrangements, however, were in the hands of an American Organizing Committee established by the American Society of Agronomy. This committee included members from each of the States, the U. S. Department of Agriculture, and Canada, and functioned largely through an executive committee consisting of Dr. Oswald Schreiner of the Bureau of Plant Industry as chairman, Dr. Lipman, Dr. C. F. Marbut, and Dr. K. F. Kellerman, with Dr. A. G. McCall as executive secretary. It is to the painstaking and conscientious efforts of this group in particular, in planning, financing, and carrying to completion the ambitious program of the congress, that its success is to be primarily attributed.

The congress received the official approval of the Federal Government in a joint resolution enacted April 3, 1926, empowering the President to extend formal invitations to foreign governments to be represented by delegates. Further official recognition was shown by

the participation of President Coolidge in its opening session and the subsequent formal reception of its members by the Secretary of Agriculture and Mrs. Jardine at the Pan American Union. The Department of Agriculture cooperated in numerous other ways, and courtesies which were much appreciated were extended by the Navy Department, the National Museum, and others, including a number of the embassies and legations, and the U. S. Chamber of Commerce, which placed at the disposal of the congress its excellent facilities as a place of meeting.

As already indicated, the attendance was unusually representative, reaching from Norway, Sweden, and Finland to Japan, New Zealand, and South Africa, and from Canada to Chile and Brazil. Over 30 countries sent delegates, and in many instances the groups were surprisingly large for so specialized a field. Most numerous was the delegation of over 20 from the Union of Socialistic Soviet Republics, followed by Germany with 17, Canada with 12, England and Scotland with 10, and Hungary with 6. The total number from abroad was approximately 130, and these included an unusual proportion of the most eminent leaders in the field. The domestic representation was also creditable, bringing the total registration to well over 500. Many of these were from the Bureau of Soils and other branches of the U. S. Department of Agriculture, but about 125 were accredited to the State experiment stations. Here also the attendance was widely distributed, including 40 States and both the Federal and territorial stations of Porto Rico. As would be expected, the departments of agronomy were most largely in evidence, but there were also some chemists, engineers, economists, and other specialists, and at least 7 station directors.

The congress extended over a period of 10 days, making possible an elaborate program. As a rule, a general session occupied the morning, the 6 commissions into which the congress was divided met simultaneously in the afternoon, and the evenings were available for the numerous social events. Two full days, however, were devoted to motor bus field excursions. The first of these covered a distance of over 200 miles into western Maryland, West Virginia, and northern Virginia, with numerous stops to observe the soil formations and typical farm practices of the region. The second involved a similar survey of the soils between Washington and Baltimore and a visit to Baltimore fertilizer factories and other enterprises, followed by a dinner at the University of Maryland.

At the close of the congress, the foreign delegates were the guests of the American Organizing Committee on a 30-day transcontinental railroad tour arranged primarily for the purpose of studying the major soil provinces, cropping regions, and other agri-

cultural features of the United States and Canada. Special opportunity was afforded for the examination of most of the principal soil profiles, as well as for brief stops in turn at the experiment stations of Tennessee, Kansas, Utah, California, and Oregon, the universities of Alberta and Saskatchewan, and Purdue, Ohio State, and Rutgers universities, as well as at numerous other points.

Interest in the congress was well sustained on the whole, although the fact that it was spread over so long a period tended to reduce the attendance in the closing days. Many of the American agronomists, for example, for whose field work this period of the year is one of great activity, returned to their posts at the close of the first week, but even their curtailed attendance enabled them to make many useful contacts and to derive much benefit. From other points of view the length of the congress was probably justified, as progress was inevitably retarded considerably by linguistic difficulties. The official languages of the congress were English, German, French, Spanish, and Italian, and many of the papers and discussions took place in German, the proportion of non-English speaking members being comparatively large. This handicap was reduced by the use of interpreters in the general sessions, and printed abstracts in English, French, and German were available for most of the papers presented before the various sections.

A further aid to mutual understanding which was freely utilized was the employment of illustrative material. Perhaps the most noteworthy feature of the entire congress, and certainly the one which was most widely commended, was the bringing together of an extensive display of soil profiles and samples, monoliths, maps, charts, diagrams, and other publications, fertilizer materials, and apparatus. Not only did a large proportion of the countries represented contribute to this exhibit, some of them quite elaborately, but almost every branch of soil science capable of exposition was depicted, in some instances with much ingenuity of device for graphic presentation.

Outstanding among the wealth of material shown by the foreign delegations was the Russian exhibit, which comprised portraits of eminent soils workers, collections of morphological features and soil colors, photographs of national landscapes and soil transformations, extensive collections of maps and charts and illustrations of profiles, and a display of typical Russian publications in soil science, for all of which catalogues and other informative literature were supplied in English. Nearly 100 soil monoliths, representing all the better known Russian types of soils, were also prepared for the congress, and while these were unfortunately delayed in transit the presentation to the Bureau of Soils during the congress of the entire

Russian exhibit, valued at approximately $50,000, provided for its permanent availability in Washington. A similar disposition was made of the exhibit of Scotland, and it is possible that one practical outcome of the congress may ultimately be the development of a collection of the soils of the world.

Maps, profiles, publications, and soil samples were also on view from Finland, Germany, Latvia, Rumania, Poland, and Hungary. The soil profiles from the last-named country attracted particular notice, presenting sections of width and depth similar to the monoliths usually ohtained but being less than 1 in. in thickness, cemented on a heavy card, and surmounted by pressed herbarium specimens of the typical vegetation. Water color illustrations of soil profiles were also much in evidence, ranging from small cards an inch or two in width and 6 to 8 in. long, showing a single soil, to a meridional section diagram several feet in length, showing the main variations in soil profile from the northernmost to the southernmost boundary of European Russia. Mention may also be made of the extensive exhibits of apparatus, including a peat sampling outfit from Sweden and a soil dynamometer with electrical recording devices from the Rothamsted Experimental Station.

The activities of the U. S. Department of Agriculture having to do with soils were depicted by several of the bureaus and other branches. Naturally, much of this work centered around the Bureau of Soils, including monoliths of typical American soils, a model showing the effect of erosion and means for its control, samples of fertilizer materials with illustrations as to their preparation by the improved method under investigation, and an exhibit of peat products ranging from fuel to fabric. The Bureau of Plant Industry displayed for its soil fertility investigations a series of pots revealing the effects of toxic and beneficial organic compounds on wheat in solution cultures and the effects of different nitrogenous compounds on soy beans, an interesting schematic representation of triangular fertilizer experiments, and a collection of the organic compounds isolated from soils. Apparatus from its fruit investigations was shown as devised for studies on the oxygen-supplying power of the soil, and charts from its nematode studies showed ecological types of soil nemas and their vertical distribution. The agricultural engineering division of the Bureau of Public Roads displayed a working model of a trenching machine. The activities of the Extension Service in relation to soil work were illustrated, and the Department Library made an interesting exposition of services rendered to the research worker in soils and related lines, displaying books and reference works, periodicals and other publications, and bibliographies.

Several of the State experiment stations had instructive exhibits. The Connecticut State station demonstrated the Morgan method for determining soil acidity, and the Maryland station displayed a revolving table which allowed growing plants a uniform supply of light. The Michigan station exhibited a new and rapid method of determining the colloidal content of soils by the hydrometer, and those from Missouri, South Dakota, and West Virginia sent apparatus used in obtaining and analyzing soil samples. The Indiana station presented Hoffer's method for showing the accumulation of aluminum and iron compounds in corn plants, indicative of deficiencies of lime and available phosphates in the soil. The Wisconsin exhibit dealt with legume root nodules, bacterial strain variations, and host plant specificity, and that of New Jersey showed cultures of soil microorganisms and synthetic soil constituents produced by the action of some of these organisms upon cellulose.

The opening address of President Coolidge dealt mainly with the efforts of the United States to promote agricultural education and research through the Department of Agriculture and the agricultural colleges and experiment stations. He stated that the Department staff in 1926 included a total personnel of 20,742 employees; that of the $44,500,000 appropriated for direct expenditure by the Department, about $10,300,000 was available for research; and that the personnel of the experiment stations, together with the research staff of the Department, constitutes the largest organized body of research workers in agriculture in the world. Yet, as he went on to say, " this does not mean that we of the United States can not learn much from the scientists of other lands. A large proportion of the scientific work done in this country has consisted in the application of discoveries in pure science that have been made elsewhere. The scientists of Europe in particular have an enviable record of fundamental research. American scientists are glad to be able to use the results of this work. They are glad, too, to take to heart the lessons of patience, of intensive scholarship, and of singleness of aim characteristic of this field of endeavor."

The broad relations of the soil to human welfare were referred to by the President and a number of other speakers, and, under the title of Soils and Men, they formed the subject of the presidential address of Dr. Lipman. He declared that " soil science must build a foundation large enough and strong enough to support the study of plant food resources and their mobilization, of the interrelations of soil and plants and of soil characteristics and peculiarities as reflected in the make-up of plants, animals, and man. . . . We are the technical advisors to the nations who are trustees of precious raw mate-

rials. These must be used wisely and conserved effectively in order that humankind may travel with the least pain and sorrow on its road of destiny."

"In a more immediate way," he made clear, "soil science has definite responsibilities in indicating rational and effective methods of land utilization. . . . By establishing standard methods of soil classification and study, we shall hasten the development of a sound program of land utilization in all countries. We shall provide then for the intensification of production and the support in greater comfort of the growing population of the world. It is the duty of soil science to establish more clearly the relation of crops to soils in order that cropping methods may best conserve plant food, solar energy, and human labor. Soil science should teach the farmers how best to modify food quality by soil treatment. It should plan a more far reaching program of research and education, in order that it might serve in a constantly larger way the needs of a human society that from year to year is growing more complex in its organization and more exacting in its demand for such of the products of the land as are essential for maintaining the moral and spiritual values that are the final measure of human activities."

In the absence, because of serious illness, of Dr. Milton Whitney, chief of the Bureau of Soils and honorary chairman of the American Organizing Committee, a review of the origin and development of that bureau was presented by Dr. A. F. Woods, director of scientific work of the Department. Dr. Woods closed his paper with an announcement of the reorganization on July 1 whereby the bureau was merged into a larger group known as the Bureau of Chemistry and Soils, in which "will be centralized all the investigational work in soil classification, physics, chemistry, soil biology, fertilizers, soil fertility, and soil technology." A resolution, introduced by Sir John Russell of Rothamsted, expressing the sympathy of the congress to Dr. Whitney, was unanimously adopted.

The scope of the remaining papers presented before the general sessions is indicated by their titles. On the economic side, Dr. Albrecht Penck of Berlin discussed The Productive Capacity of the Globe, while Dr. O. E. Baker of the Bureau of Agricultural Economics took up The Trend of Land Utilization in the United States, and Mr. Charles H. McDowell considered Fertilizers and Soil Science. Dr. K. D. Glinka of Leningrad presented A Brief History of Russian Soil Science, and Dr. A. Itano of the Ohara Agricultural Institute described The Present Status of Soil Acidity in Japan. The Determination of Soil Acidity was taken up by Dr. O. Lemmermann of Berlin, and The Present Status of Soil Biology by Sir John Russell.

At the closing general session several minor changes in the constitution of the society were adopted, one of which provided for

the transfer of the publication of its journal from Rome to Berlin and its issuance as a quarterly by the general committee instead of by the International Institute of Agriculture. An invitation from the Soviet Government and the Russian Academy of Sciences to hold the second congress in the Union of Socialistic Soviet Republics was announced, and authority was granted accordingly, provided a guaranty of sufficient attendance is obtainable. It is expected that the congress will be held in Leningrad and probably in 1929. The presidency of the society was bestowed on Dr. Glinka, who is director of the Soviet Experiment Station at Leningrad, and Dr. Hissink was continued as acting president and general secretary.

Over 300 papers were listed in the programs of the 6 sections or commissions into which the detailed work of the congress was divided. This was a heavy assignment, resulting with some of the commissions in long hours and extra sessions, while with others more rapid progress was made. In general, each commission had its own program, but there were numerous combinations for joint meetings on subjects of mutual appeal.

The first commission, devoted to soil mechanics and physics, dealt largely with questions of methods, although numerous papers giving data on local soil conditions were included in the program. Discussion centered largely around the questions of the preparation of the soil samples and the division of the soil into fractions in mechanical soil analysis, standard apparatus, the best method for the determination of the water-holding and air capacities of the soil, its plasticity, moisture equivalent, heat-of-wetting, and other physical properties, and the relation of these to the behavior of the soil in the field. Such topics as sampling and the propriety of certain chemical treatments to effect dispersion attracted particular attention, and while full agreement was not reached the feeling was general that much progress had been made in bringing about the international decision on these matters which would be so helpful.

The second commission, dealing with soil chemistry under the leadership of Dr. A. A. J. von Sigmond of Hungary, showed, like the first commission, an immediate interest in methods, but covered a somewhat wider range of subjects. Its four main topics were soil absorption, the preparation of soil extracts, the organic matter and nitrogen content of soils, and the chemical determination of the nutritive materials in soils. There was a clarifying exchange of points of view on these matters and, as in Commission I, considerable progress in the promotion of a better understanding and greater uniformity.

Commissions III and IV, dealing, respectively, with soil biology and biochemistry and soil fertility, presented more generalized programs, but with many important papers. Commission III offered a series of symposia concerned respectively with direct and cultural methods of microbiological analysis of soil, the soil population, nitrogen fixation in the soil, the transformation of nitrogen, of organic matter, and of minerals in the soil, and soil biology from an agronomic standpoint. Commission IV took up the estimation of the nutrient requirements of soils and plant stimulants by means of plants in field, pot, and germination experiments, the determination of fertilizing elements and of lime requirements by means of plants, and the influence of soil cultivation upon crop yield and the supply of water and air to plants.

Although by no means the largest in numbers, Commission V, dealing with the classification, nomenclature, and mapping of soils, was one of the most important and productive. An earnest effort was made by this commission, led by Dr. Marbut, to obtain an international understanding on soil survey methods and nomenclature, and, after earnest and prolonged discussion, this culminated in the adoption of a resolution recommending that the Russian system of classification, based on natural soil characteristics, should be extended throughout the world, its groups to be more clearly defined and subdivided with increasing knowledge. The resolution further recommended that each country should present to the next congress a scheme of classification of its soils "broad enough to cover the characteristics of soils which have developed through the influence of temperature, moisture, natural vegetation, relief, and the mineralogical and chemical composition and age of the parent material," and should also prepare "a complete series of color, chemical, and mechanical soil profiles, representing the soil types in each country in as much detail as the available knowledge will permit." For the continuation of this work, the commission was divided into five subcommissions, to take up, respectively, the soil maps of Europe, the Americas, Africa, Asia, and Australia. In addition, the various countries were requested to inaugurate "a series of detailed investigations into the influence of soil characteristics on various crop plants through a close correlation of soil characteristics and yield on a great number of experimental plats, to the end that data may be accumulated on the basis of which an evaluation for practical purposes of the units of a natural scheme may be established or an independent practical scheme of classification built up."

In response to an insistent demand on the part of attending foresters and others interested in forest soils problems, there was organized during the congress a special conference under the leader-

ship of Dr. F. Weis of Denmark and Dr. Raphael Zon, director of the Lake States Forest Experiment Station, to which the numerous papers on the program dealing directly with forest soil investigations were assigned. Two sessions were held, and despite the impromptu nature of the assembly, there was an excellent attendance and keen interest. There was a general conviction that the time had arrived for forestry workers to take up a more intensive study of the relation between the soil and the forest flora and the reciprocal effect of the forest upon the physical make-up of the underlying soil and its productivity. So successful was the conference that provision was made by the congress for its perpetuation as a subcommission of Commission V.

The sixth commission dealt with the application of soil science to land cultivation and was of special interest to agricultural engineers. A special feature of its program was the drainage and improvement of peat lands, the discussion of which ended with the formation of a subcommission on peat soils, headed by Dr. A. P. Dachnowski of the U. S. Department of Agriculture. Irrigation was also dealt with in its different phases, including the overhead irrigation of truck crops, and considerable attention was given to the movement of water through soils as a factor involved in both drainage and irrigation practices. It was brought out in this discussion that the fundamental factors in the movement of soil water are yet to be elucidated, and that the laws of such water movement must be definitely tied in with certain soil characteristics, such as specific surface, before they can be made universally applicable. Still other features of the work of the commission dealt with the action of acid and alkaline soils on concrete drainage and irrigation structures and the broad question of soil erosion and its prevention.

Taken as a whole, the congress covered the subject of soils in a broad and comprehensive way, and in many directions its contribution was positive and powerful. In some respects its immediate results may not have seemed as tangible as had been hoped, but it is not unlikely that too much was attempted in view of the serious handicaps under which its promoters labored. Probably no international assemblage allied to agriculture has ever been confronted with greater linguistic difficulties, nor has one been attempted with such definite objectives when so much still had to be learned as to what had been already done. The outstanding result in international assemblages of this type is customarily the mingling of personalities and the interchange of viewpoints, and the soils work, because of the unusual geographical distribution of its leaders, has always been peculiarly hampered by a lack of personal contacts and understand-

ings. This handicap the congress was very successful in overcoming from its opening day, and with the supplementary influence of the long tour of this country and Canada it should henceforth no longer impede seriously the development of closer relations. The illustrative material which was so distinctive a feature of the congress was another notable aid, and it may now be said that for the first time soils workers in this country are really acquainted with the soils and the soil specialists of the world. If the congress had been productive of no further achievements, this alone would have been an abundant justification, but, as a matter of fact, much progress was made in a number of specific undertakings and the foundation has doubtless been firmly laid for even more perceptible advances within the next few years.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry and the home, H. E. Howe and F. M. Turner, jr. (*New York: Charles Scribner's Sons, 1927, pp. X+355*).—A collection of popular articles on chemistry in its relation to home construction, home furnishing, and home operation.

Viscosity of cellulose solutions, C. R. Genung (*Indus. and Engin. Chem., 19 (1927), No. 4, p. 476, fig. 1*).—Small's method[1] is modified by using a filter pump instead of a movable mercury reservoir to create the partial vacuum required and in the removal of air from the cellulose bulb by repeated washing out with hydrogen. The apparatus has been further simplified by replacing the storage bulb and burette for the cuprammonium solution by a measuring pipette which is filled by using hydrogen under a pressure of 50 to 75 mm. Some other slight changes are made in the apparatus, the modified form of which is illustrated. Somewhat higher viscosity figures are obtained by the modified method and are attributed to its complete removal of oxygen.

A simple continuous-extraction apparatus, A. H. Clark (*Indus. and Engin. Chem., 19 (1927), No. 4, pp. 534, 535, figs. 2*).—A simple and inexpensive apparatus for the continuous extraction of relatively large amounts of material is described and illustrated. Among the advantages claimed are the fact that the entire mass under extraction is continuously in contact with the solvent, so that channeling is avoided, and that the receiving flask and volume of solvent may be made comparatively small with relation to the amount of material treated.

Automatic devices for the extraction of powdered materials, S. Palkin and H. R. Watkins (*Indus. and Engin. Chem., 19 (1927), No. 4, pp. 535–537, figs. 2*).—Two automatic devices for the extraction of solid substances are described. One is an inexpensive and simple device, in which the solvent flows upward through the sample and is continuously filtered through cotton in returning to the heating vessel. The other device, which is somewhat more complicated, uses the pressure effect of the solvent vapors to agitate the suspended sample. Continuous filtration is effected as in the simpler form. This apparatus is applicable to the extraction of liquids as well as solids.

A comparison of some physical and chemical tests for determining the quality of gluten in wheat and flour, D. A. Coleman, H. B. Dixon, and H. C. Fellows (*Jour. Agr. Research* [*U. S.*], *34 (1927), No. 3, pp. 241–264*).—Correlation data on loaf volume with respect to (1) kernel texture, (2) crude protein content of the wheat, (3) crude protein content of the flour, (4) dry gluten, (5) wet gluten, (6) water-absorbing power of the flour, (7) water-holding capacity of the flour, (8) single concentration viscosity of flour-water suspensions, and (9) Sharp and Gortner's angle *b* (E. S. R., 51, p. 803; 53, p. 314), together with correlations between these various tests of gluten quality,

[1] Indus. and Engin. Chem., 17 (1925), No. 5, pp. 515–517.

indicated the crude protein determination, on either the wheat or the flour, as the best single factor gluten quality test. The washed-gluten test was found second in order of value, giving excellent results in the hands of one analyst, but failing in reproducibility of results. Of the newer viscosity tests, only the single concentration test was satisfactory. This was nearly as good as the dry- or wet-gluten tests, and decidedly better than the kernel-texture or water-absorbing power tests. The lack of close agreement among the results of the newer gluten quality and loaf volume tests is attributed in part to nonuniform baking procedure.

The ash of hard spring wheat and its products, B. Sullivan and C. Near (*Indus. and Engin. Chem., 19 (1927), No. 4, pp. 498–501*).—Complete analyses of a hard spring Marquis wheat showed that the ash of this wheat and its flours contains in general more phosphorus and magnesium and less potassium than the ash of softer wheats and flours. Iron, manganese, zinc, copper, aluminum, iodine, boron, fluorine, and arsenic were found in the smallest amounts in the highest grades of flour. The bran and germ contained the highest proportion of these elements. The rigid standardization of the flour ashing methods with regard to time and temperature conditions is regarded as undesirable on account of the differences in chemical composition among the ashes, which differences are considered to demand different treatments.

Commercial gelatins: Their jelly strength, gold number, and hydrogen-ion concentration, P. Serex and M. W. Goodwin (*Indus. and Engin. Chem., 19 (1927), No. 4, pp. 473, 474*).—Careful determinations of the gold number, the jelly strength, and the H-ion concentration, the latter determination being made by a precise electrometric method, showed no direct relation among these values as determined in gelatins used in the ice cream trade. Not only were considerable variations found between the various grades of one manufacturer, but also between supposedly similar grades from different manufacturers. For example, one gelatin sold as high grade had a jelly strength of 339, whereas another of the same designation had a jelly strength of but 189.

Determination of milk solids in food products.—I, A direct method for the milk proteins in cacao products, H. C. Waterman and H. A. Lepper (*Indus. and Engin. Chem., 19 (1927), No. 4, pp. 501–506, fig. 1*).—A review of the methods dependent on the determination of casein and the conversion of the figure obtained to a total milk protein figure by means of a factor shows the necessity of a new line of attack. The inevitable direct errors of the casein method are considerable and are liable to exaggeration on account of the inconstancy of the factor casein to total milk protein.

It was found that casein, lactalbumin, and lactoglobulin can be separated as a group from the cacao protein group by a method involving (1) the pre-extraction of interfering substances by means of (*a*) an acid-alcohol reagent, and (*b*) an aqueous-acid reagent, adjusted at about pH 2.2 and containing sodium sulfate in a concentration of 1/28 molar to prevent the solution of the milk proteins; (2) the selective extraction of the milk proteins with a borate-sodium hydroxide buffer mixture of pH 11.6 to 11.8; and (3) the precipitation of the milk proteins from this extract at approximately pH 4.4 to 4.5. The directions for carrying out the method are necessarily too detailed to be abstracted.

"Most of the results have shown less than 0.15 per cent departure from the calculated milk protein content of the milk chocolates examined. No specialized technique is required in carrying out the determination, and no elaborate apparatus is needed with the exception of a good centrifuge."

METEOROLOGY

Ohio weather for the year 1925 (*Ohio Sta. Bul. 402 (1927), pp. 143–155, figs. 3*).—Data for temperature, precipitation, and length of frost-free period at the experiment station at Wooster and other places in the State are summarized as usual in tables, charts, and notes. The year was characterized especially by a deficiency in precipitation during the first six months and in August, a wide range in temperature (126°), and an abnormal amount of sunshine during the first six months, especially in April. There was, however, an unusually favorable combination and distribution, both geographically and chronologically, of the major climatic elements, resulting in good crop yields, as previously noted (E. S. R., 55, p. 210).

SOILS—FERTILIZERS

Principles of soil microbiology, S. A. Waksman (*Baltimore: Williams & Wilkins Co., 1927, pp. XXVIII+897, pls. 19, figs. [78]*).—This book presents the known facts of soil microbiology, with an interpretation of these facts; a study of soil microbiological literature, with a large selected bibliography of this, and of the literature of related work; and an indication of the various directions of present and of needed investigation, with notes on the history of soil microbiology from its inception in the work of Liebig and Pasteur to the present time. The snbject matter is treated in four sections, dealing, respectively, with (1) the occurrence and differentiation of soil microorganisms; (2) their isolatiou, identification, and cultivation; (3) their chemical activities; and (4) the relation of soil microbiological processes to soil fertility. Under these general headings are included studies of all the known groups of soil bacteria as well as of the algae, fungi, Actinomyces, and protozoa, together with some notes on such nonprotozoan soil fauna as Nematoda, Rotatoria, Annelida, Insecta, etc. Methods are treated in considerable detail, and, in addition to the bibliography, abundant footnote references are given throughout the text.

Effects of clover and alfalfa in rotation.—I, The carbon dioxid in the soil atmosphere and its action on the felspar particles in the soil, W. P. Headden (*Colorado Sta. Bul. 319 (1927), pp. 71, fig. 1*).—Nitrogen accumulation by leguminous crops not plowed under was found to be very small, quite insufficient to account for the soil improvement obtained by growing these crops, and similar though less marked improvements of fertility were effected by some nonleguminous crops. Determinations of the carbon dioxide of the soil atmosphere under fallow conditions and in soils under grasses and under clover showed about 50 parts per 10,000 in fallow, 153 parts in the grass-bearing, and 174 parts in the clover-bearing soils, respectively, at a depth of 30 in. Preliminary experiments indicate that such crops as potatoes, beets, and corn, which do not occupy the soil to such an extent as do wheat, oats, clover, alfalfa, and grasses, increase the soil carbon dioxide content much less than do the latter crops. Such concentrations of carbon dioxide as are produced by the latter crops were found to cause the solution of potash and phosphoric acid from the feldspar constituents of the soil. Excessive nitrate production was also shown to be suppressed by the crops found effective in carbon dioxide production, and this effect is tentatively attributed to an inhibitive effect of the increased carbon dioxide concentration in the soil atmosphere. The presence of small quantities of finely divided iron derived from grinding apparatus was found to increase distinctly the solubility of the feldspar in carbon dioxide-saturated water.

[Soil and fertilizer experiments at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 15–25, 113, 115, 117*).—It is reported that for 12 years out of a 16-year test of the livestock farming system as against the grain farming system, each ton of manure returned to the land averaged 15.2 lbs. of nitrogen, 3.9 lbs. of phosphoric acid, and 11.6 lbs. of potash. These figures represent 60 per cent more nitrogen and 40 per cent more potash than are found in the average mixed open-yard manure of average Ohio farms. The yields from the grain system have also been excellent, however, with no indication of progressive decrease in fertility.

Liming increased the yields of red and sweet clover more than heavy manuring without lime, and sweet clover was found to be more exacting in its lime needs than red clover.

The value of sweet clover as a green manure, especially on the limestone soils of western Ohio, was demonstrated at the Paulding County experiment farm, in 2-year rotations of corn and oats on a heavy phase of Brookston clay. The sweet clover green manure crop increased the corn and oats yields considerably more than did 8 tons of untreated manure. The estimated increase in the value of the crop due to sweet clover was more than double that obtained with red or mammoth clover.

In field plats 4.2 tons of granulated slag and in cylinders 4.7 tons were required to correct soil acidity to the same extent as did 1 ton of limestone. Grinding more than doubled the effectiveness of the slag, but it still had only 61 per cent of the neutralizing value of ground limestone in the plat soils and 48 per cent in the cylinder soils.

In experiments covering periods of from 29 to 32 years, continuous cropping to corn has proved destructive to organic carbon and nitrogen in the soil. This is attributed to the stimulation of decomposition processes by cultivation and to a relative paucity in root and stubble residues from corn. Continuous cropping to oats and wheat similarly impoverished the soil, though less markedly than did corn. The losses in organic carbon and nitrogen were less under a corn, oats, wheat, clover, and timothy rotation, and still less under a corn, wheat, and clover rotation than under continuous grain cropping; but even where clover has been plowed down every third year there has been an apparent loss of about one-fifth of the original organic matter and nitrogen in the 29 years in which only the roots and stubble of the crops harvested have been returned to the soil. An application of 116 tons per acre of stable manure on one plat maintained the organic matter at about the original level, though some nitrogen was lost. The limed end of this plat has yielded good crops continuously. The yields from the unlimed end have been lower, but better for the last than for the first 10 years. This and other fertilizer experiments are taken to indicate that the necessary fertilizing constituents are more important for the maintenance of crop yields than are soil organic matter and nitrogen.

Studies of exchange bases in fertility plat soils showed that the saturation absorptive capacity of one acre was equivalent to the base content in 4 tons of limestone. In the unlimed soils about 25 per cent of this absorptive capacity is taken up by basic elements, the remaining 75 per cent being taken up by H ions. On the limed soil the bases amounted to 96 per cent of the saturation and the H ions 4 per cent. Out of 16 tons of limestone applied, 3 tons are represented by exchangeable calcium and magnesium, while nearly 12 tons have been lost in crops and drainage. Liming has materially reduced the exchangeable sodium and potassium, probably as a result of the larger crops

chloride per rotation, 5 per cent of the total potassium applied now remains in exchangeable form in the limed soil and 14 per cent in the unlimed soil. The use of sodium nitrate has not resulted in the retention of any considerable quantity of active sodium in the surface soil. An application of 680 lbs. of sodium nitrate per rotation left 94 lbs. of exchangeable sodium on unlimed soil and 70 lbs. on limed soil. It is concluded that injury from the free use of sodium nitrate on soils of this type under Ohio conditions is not to be expected.

Applied at the rate of 4 tons per acre on corn, sheep manure produced average increases of 14 bu. of corn, 600 lbs. of soy bean hay, 5 bu. of wheat, and 850 lbs. of mixed hay. Where 2 tons of the manure were applied on the wheat and 2 tons on the corn the increased profits were greater than when the manure was used on one crop.

In experiments on the preparation of artificial manures from straw and corn stalks, two compost piles were made containing 1 ton of shredded corn stover. In one pile 150 lbs. of Adco was incorporated, while in the other 65 lbs. of ammonium sulfate and 150 lbs. of ground limestone were used. Immediately, a rapid decomposition was noted, and more water was added at intervals of two or three days whenever the temperature was found too high. Chemical analysis made after two months showed that the Adco product contained 8.5 lbs. of nitrogen, 3.8 lbs. of phosphorus, and 3.3 lbs. of potassium per ton. The ammonium sulfate and limestone product was not far different in composition, though containing less phosphoric acid. The losses of both nitrogen and potash were so high from both piles as to render either method of doubtful economy unless the leaching, to which this loss was attributed, could be prevented.

[Soil and fertilizer studies at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 34, 35, 40*).—The progress of various series of experiments on rotation, fertilizers, and soil improvement is reported.

Among the definite results already obtained are a 4-year rotation of cotton with corn, oats, and cowpeas, resulting in from 183 to 235 lbs. of lint per acre as against 45 to 59 lbs. from continuous cotton; fertilizer experiments showing 200 lbs. of acid phosphate and 100 lbs. of cottonseed meal to give the largest yields in both the rotated and continuous cotton; a 12-year average yield of 193 lbs. of lint per acre from cotton in rotation as against 150 lbs. from continuous cotton; and similar results at the Lubbock Substation in 3-year rotations of cotton fertilized with manure, feterita, and fallow. At the Temple Substation, sulfur applied at the rate of from 50 to 2,000 lbs. per acre was found to have no significant effect upon either continuous cotton or cotton in rotation with corn and oats. Larger applications of sulfur were deleterious.

Nitrogenous fertilizer materials, C. A. Mooers (*Tennessee Sta. Circ. 9 (1927), pp. 4*).—The use of sodium nitrate, cottonseed meal, ammonium sulfate, and cyanamide for tobacco, cotton, potatoes, and other crops is discussed. The properties and fertilizer behavior of each of these four nitrogen sources are noted, and a number of mixed fertilizer formulas for specific crops and conditions are given.

Commercial fertilizers, 1927 edition, R. H. Robinson (*Oregon Sta. Circ. 78 (1927), pp. 23*).—Information on the valuation of fertilizers and fertilizer materials; on the interpretation of the analyses of fertilizers, of their components, and of limes and land plasters; and on the calculation of cost per unit of plant food, is given, together with analyses of commercial brands of these products sold in Oregon.

Inspection of fertilizers, J. B. Smith and W. L. Adams (*Rhode Island Sta. Ann. Fert. Circ., 1926, pp. 14*).—The usual guaranties and analyses of fertilizers and fertilizer materials and agricultural limes and ashes are reported, with some notes on the economical purchase and utilization of these materials.

AGRICULTURAL BOTANY

A textbook of general botany, W. H. Brown (*Boston and London: Ginn & Co., 1925, pp. XI+484, figs. 518*).—"In this book an attempt has been made to treat botany from the standpoint of general principles rather than as illustrated by special plants used as types, and from a world point of view rather than from a local one. . . . Other features which give the book a universal aspect consist in methods of presentation rather than in selection of subject matter, except in so far as widely known species are used in the illustrations. . . . The greater part of the book is devoted to the morphology, physiology, and reproduction of the seed plants. . . . The plant is treated as a working machine, physiology and morphology being taught together. . . . The proportion of space devoted to the lower plants is less than in many texts."

Syllabus of plant families, A. Engler and E. Gilg (*Syllabus der Pflanzenfamilien. Berlin: Borntraeger Bros., 1924, 9.–10. ed., pp. XLIII+420, figs. 462*).—The seventh edition of this work has been noted (E. S. R., 29, p. 216). The enlargements and other changes embodied in the eighth edition and in the present edition are outlined in prefaces.

General plant geography, A. Hayek (*Allgemeine Planzengeographie. Berlin: Borntraeger Bros., 1926, pp. VIII+409, pls. 2, figs. 5*).—This highly systematized work is intended as a condensed review of questions, problems, and facts of general plant geography as presented in recent extensive literature, a large collection of which is listed under the names of authors, alphabetically arranged.

A manual of the flowering plants of California, W. L. Jepson (*Berkeley: Associated Students Store, Univ. Calif., [1925], pp. 1238, figs. [1024]*).—This work, purporting to be a complete account of the native seed plants in California, has been issued in six sections, which are here assembled.

A study in the grouping of plants, H. S. Jurica (*Bot. Gaz., 78 (1924), No. 3, pp. 326–334, figs. 14*).—In view of the fact that not only are mere clumps, clusters, or groups of a given species seen on a field trip, but that at times considerable patches or even entire areas seem to be dominated by a single species, and in view of the questions which arise as to the factors responsible for such grouping, especially in case of the virgin prairie, this investigation was undertaken. The present study deals with a few plants, reproducing vegetatively, which spend a number of years in developing either a horizontal or a vertical rhizome before sending forth a flowering stem.

Biochemistry of plants, F. Czapek (*Biochemie der Pflanzen. Jena: Gustav Fischer, 1925, 3. ed., vols. 2, pp. XII+541; 3, pp. IX+852*).—This third edition (or imprint), of which the first volume has been noted (E. S. R., 49, p. 218), is stated on its title page to remain unchanged.

Electrophysiology of plants, K. Stern (*Elektrophysiologie der Pflanzen. Berlin: Julius Springer, 1924, pp. VII+219, figs. 32*).—This book, No. 4 of a series of Monographs in the General Field of Plant and Animal Physiology, deals with the physical principles of plant electrophysiology, the influence of electricity on protoplasm and cell, the quantitative relation between stimulation and reaction, electrotaxis, electrotropism, electronasty, the influence of electricity on development and metabolism in the plant, the production of electrical energy by the plant, and problems and data of plant electrophysiology. A list of related literature is furnished.

Physiology and biology of mustard [trans. title], F. Boas and F. Merkenschlager (*Biol. Zentbl., 45 (1925), No. 1, pp. 40–53, figs. 6*).—A study, chiefly of Sinapis (*S. alba*), is outlined as to biological relations and reactions. The work has been continued and enlarged as to scope.

Light relation of plants, W. W. Robbins (*Through the Leaves, 13 (1925), No. 9, pp. 386, 387*).—The chemical, heating, stimulus, and form effects of light on plants are very briefly discussed.

Cultivation of plants in electric light and its application in seed testing and plant breeding [trans. title], N. A. Maximow (*Biol. Zentbl., 45 (1925), No. 10, pp. 627–639*).—Tests of the effect of electrical illumination on the development of plants throughout a systematic range, including wheat, barley, buckwheat, peas, beans, and cucurbits, were carried out and were successful in the production and maturing of seed in case of the first four named. Details are given bearing upon the apparent possibilities of such work.

The physical basis of life, D. T. MacDougal (*Roy. Canad. Inst. Trans., 15 (1924), pt. 1, pp. 35–48, figs. 5*).—A review is given of the supposed or inferred, as well as the known, phenomena and phases of life, chiefly in plants at and since its inception on the earth, presumably in jelly-like masses or aggregations resulting from chemical combinations among such substances as hydrocarbons, nitrites, ammonia, and hydrogen phosphide, and almost certainly occurring in warm, shallow, brackish coastal waters. The more recently recorded results of studies on growth, as to its nature, its progress, and its fluctuations, are presented in simplified form.

"It is quite possible that we may be able to read something of earth history from the activities of the protoplasm of trees, which are calculated to be extremely sensitive to climatic agencies. . . . On the other hand, we have the best of evidence to the effect that many hereditary streams of protoplasm have been modified in scores or hundreds of ways in shorter periods, and that living material in numerous lines of descent is still capable of developing new organisms. It is inconceivable that it will ever lose this capacity."

Laws of growth in higher and lower plants [trans. title], A. Rippel (*Naturw. u. Landw.* [*Freising*], *No. 3 (1925), pp. 90, figs. 5*).—This contribution deals in systematic detail with phases of growth and yield. The literature cited comprises more than 130 titles.

Growth regulators in Avena coleoptiles [trans. title], E. Seubert (*Ztschr. Bot., 17 (1925), No. 2, pp. 49–88, figs. 4*).—Curvatures and alterations and reversals of curvature with differences in concentration of the media in decapitated, wounded, and manipulated growing Avena coloeptiles, subjected to contact with media and to differences in growth associated with such contacts and with differences in illumination, suggest the possibility that in the normal phototropic process in Avena coleoptiles materials having the nature of growth regulators may function as light perceptors. The idea is suggested of an enzym which under the influence of varying light becomes weaker or stronger. It is stated that under geotropic stimulation corresponding results may be obtained. Further possibilities are suggested.

The calcium requirements of algae and fungi [trans. title], O. Loew (*Biol. Zentbl., 45 (1925), No. 2, pp. 122–125*).—The calcium requirements of the lower organisms listed, in part fungi, may have economic bearings.

[Chlorophyll and assimilation], K. Noack (*Ztschr. Bot., 17 (1925), No. 9–10, pp. 481–548, figs. 2*).—An account is given of the photochemical activities of chlorophyll and of their significance for carbon dioxide assimilation.

Photochemical activity of chlorophyll [trans. title], K. Noack (*Naturwissenschaften, 14 (1925), No. 18, pp. 383–389, figs. 2*).—The author gives, after a brief historical introduction, an account of his own approach to the problems related to the formation of organic substances by plants from carbon dioxide through the agency of light energy. Some of this work, as published, has been noted (see above). In this approach, it is assumed, apparently, that chloro-

phyll has, in vitro as well as in the living plant cell under illumination, oxygen-activating qualities which are bound up with the quality of fluorescence in the chloroplasts. Acceptors of oxygen studied include benzidine and chlorophyll both in dead and in living leaves.

Carbon dioxide assimilation in dead leaves [trans. title], H. MOLISCH (*Ztschr. Bot., 17 (1925), No. 11, pp. 577–593*).—Leaves of many kinds, after being killed by drying in a certain way, still showed a capacity to assimilate carbon dioxide and evolve oxygen under illumination. This capacity appears to be the rule, rather than the exception as formerly thought. The influences of treatments and conditions are outlined. It is considered not improbable that the biochemical process of photosynthesis may eventually prove to be really one of fermentation.

Relation of low temperatures to respiration and carbohydrate changes in potato tubers, E. F. HOPKINS (*Bot. Gaz., 78 (1924), No. 3, pp. 311–325, figs. 7*).—In determining the respiration of potatoes at low temperatures the author found a marked acceleration at 0° C. (32° F.), such that for a considerable period the intensity was greater than at 4.5° C. This stimulation decreased after passing the maximum, and was still greater than 4.5 at the end of the experiment. Other changes are indicated.

It is said that, in agreement with results reported in the literature, sugar which accumulated in potatoes at 0° began to disappear rapidly when they were stored at 4.5°. It is suggested that the acceleration of respiration at 0° may be dependent upon the changing concentration of sugar, and that up to a certain concentration sugar increases respiration and inhibits it beyond that point.

Osmotic pressure in roots and the part played by living cells during water ascent in plants [trans. title], L. MONTEMARTINI (*Atti Ist. Bot. R. Univ. Pavia, 3. ser., 1 (1924), pp. 35–45, pls. 2*).—In addition to the so-called suction or drawing action of the leaves, it is claimed that there is a cell-to-cell action modifying the osmotic properties of the absorbing tissue of the roots.

On the use of the Bates' evaporimeter and evaporimeters in general in studies on plant transpiration, especially in the open air, B. NATH SINGH (*Jour. Indian Bot. Soc., 4 (1924), No. 5, pp. 149–179, pls. 4*).—The Bates evaporimeter is disadvantaged mechanically by the difficulty of accurately weighing the small quantity of water evaporated per hour and by the existence of water in the reservoir with different temperatures at different times. Suggestions are made in view of these defects. It is also concluded that, other (internal) factors in the plant being equal, transpiration and evaporation from an evaporimeter are not affected alike in the open unless wind velocity is controlled. The results obtained from potted plants indicate that transpiration and evaporation do not always vary in the same way, in direction or magnitude, owing to the existence of internal factors in plants influencing transpiration. It is also concluded that evaporation from the shallow water pan approximates more nearly transpiration than does the Bates evaporimeter. A discussion regarding the complexity of the transpiratory process is included. It is believed that a simple method is yet to be devised for ascertaining the absolute transpiration in the open field for ecological purposes.

The nervous mechanism of plants, J. C. BOSE (*London and New York: Longmans, Green & Co., 1926, pp. XIX+224, figs. 82*).—"In the light of the results summarized . . ., it can no longer be doubted that plants, at any rate vascular plants, possess a well-defined nervous system.

"It has been demonstrated that excitation is conducted by the phloem of the vascular bundle, and that conduction in this tissue can be modified experi-

mentally by the same means as is that in animal nerve. The conducted excitation may, therefore, be justly spoken of as nervous impulse and the conducting tissue as nerve.

"It has been further shown that, as in the animal, it is possible to distinguish sensory or afferent and motor or efferent impulses, and to trace the transformation of the one into the other in a reflex arc. The observations involve the conception of some kind of nerve center. No structure corresponding to the nerve ganglion of an animal has, indeed, been discovered in the pulvinus of *Mimosa pudica*, but it is not impossible that the physiological facts may one day receive histological verification."

Biological possibilities as to crop increase, II, [trans. title], O. Loew (*Biol. Zentbl., 45 (1925), No. 1, pp. 53–56*).—Chiefly, this discussion deals with plant excitants or stimulants.

Cell stimulation [trans. title], A. Kern (*Biol. Zentbl., 45 (1925), No. 2, pp. 125–127*).—Potassium, sodium, and calcium compounds acting as seed stimulants gave encouraging results.

Cell stimulation with bases [trans. title], T. Bokorny (*Zellstimulationsforsch., 1 (1925), No. 3, pp. 299–313*).—Stimulation with bases favors secretion, increases movement, and promotes growth. Stimulation by means of bases is regarded as of universal biological significance, giving results probably in all the various fields of biology, including the animal kingdom.

The behavior of plants from stimulated seed in the second generation [trans. title], M. Popoff and G. Paspaleff (*Zellstimulationsforsch., 1 (1925), No. 3, pp. 369–372*).—Seed from stimulated plants show a notable after-effect in the second generation as regards both germinability and vigor; also, these seeds so altered are said to possess the capability, after repeated stimulation, to increase still further their life potency.

The stimulating action of salts of metals on the germination of barley [trans. title], J. Noeldechen (*Kühn Arch., 9 (1925), pp. 264–309*).—These studies dealt with compounds, including those of manganese, copper, mercury, silver, zinc, lead, and sodium, as stimulators of barley seeds. Conclusions and discussions are given for each metallic compound. From a general statement, it appears that the degrees of efficiency of such treatments, and the practicability of employing metal salts as stimulators of germination, may be turned to practical account after this phase of the matter has been adequately studied.

Seed potato stimulation [trans. title], W. Gleisberg (*Zellstimulationsforsch., 1 (1924), No. 2, pp. 239–255; 1 (1925), No. 3, pp. 315–354, figs. 2*).—As a partial report on this work, it is stated that it is possible to influence both germination and growth of the potato by pretreatment of the seed with chemical solutions, particulars regarding which are given.

The specific action of some excitants on the leaf [trans. title], L. Montemartini (*Atti Ist. Bot. R. Univ. Pavia, 3. ser., 1 (1924), pp. 1–12*).—Specific excitant influence on leaf activities was found for calcium, phosphorus, and potassium.

Traumatropism in plants [trans. title], A. Beyer (*Biol. Zentbl., 45 (1925), Nos. 11, pp. 683–702, figs. 8; 12, pp. 746–768, pl. 1, fig. 1*).—Both in monocotyledons and dicotyledons, two correlations, nutritional-physiological in character, are apparent, which are regarded as important to the understanding of positive traumatropic reactions. One of these correlations consists in the growth-promoting influence of the growing point of the seedling. The other consists in the fact that the growing region is dependent upon the afflux of the nutrient materials supplied from the reserve stores. A one-sided checking or limitation of the flow of materials results in a tropic flexure, a positive wound tropism, which should not be confused with geotropism, phototropism, or any negative tropism.

Injuries to vegetation by tar vapors [trans. title], K. Böning (*Forsch. Geb. Pflanzenkrank. u. Immunität Pflanzenr. No. 2 (1926), pp. 77–88, figs. 5*).—Tar vapor effects on different plants are shown and described, with brief historical review.

Germination conditions for Tilletia spores [trans. title], J. Hahne (*Kühn Arch., 9 (1925), pp. 157–263*).—Results are detailed of this attempt to solve both scientific and practical questions regarding the conditions of germination of Tilletia spores.

Studies on Ascomycetes collected in Algeria, I [trans. title], C. Killian (*Bul. Soc. Hist. Nat. Afrique Nord, 16 (1925), No. 3, pp. 108–122, pls. 3*).—Results of cultural studies on species in several genera are detailed.

The developmental history and sexual physiology of Ustilago bromivora and U. grandis [trans. title], R. Bauch (*Ztschr. Bot., 17 (1925), No. 3, pp. 129–177, figs. 4*).—These studies were carried out during the period September, 1922, to September, 1924. Both sexual and sporulating phases are presented. A bibliography is furnished.

Researches on leguminous root tubercles [trans. title], P. A. Dangeard (*Botaniste, 16. ser., 1926, pp. 3–270, pls. 28*).—In the first part of this elaborate presentation the author deals with leguminous root tubercles separately in each of six groupings. In the second part the more general considerations are presented.

The Ostwald viscosimeter for the determination of the liquefaction of gelatin by bacteria, F. W. Shaw (*Jour. Bact., 9 (1924), No. 4, pp. 315–320, fig. 1*).—Referring to the defects pointed out and to the existing need for a standardized method for ascertaining the change in the viscosity of gelatin culture media as these matters were set forth by Levine and Carpenter (E. S. R., 50, p. 526), the author states that direct inoculation of sterilized gelatin culture media in Ostwald's viscosimeters were found to give satisfaction for a period of three months. Tabulated results of the author's studies with comments on observed phases point to disturbing conditions, which are said to be so general that a viscosity standard needs to be worked out to replace the per cent gelatin standard now in use.

GENETICS

[Contributions to plant genetics] (*Hereditas, 9 (1927), pp. 10–44, 49–101, 113–136, 145–168, 193–208, 225–288, 303–390, 405–418, figs. 95*).—These pages embrace the following articles: Genetic Studies on the Seed Color of *Linum usitatissimum* [trans. title], by T. Tammes (pp. 10–16); A Study of *Antirrhinum orontium*, by E. R. Saunders (p. 17–24); Some Cases of Heritable Variations in Habitual Binomial Segregation Relative to Awning in Wheat [trans. title], by B. Kajanus (pp. 25–32); The Difference in the Rapidity of Germination of Male and Female Seed in Melandrium [trans. title], by C. Correns (pp. 33–44); Peculiar Genetic Results Due to Active Gametophyte Factors, by E. M. East (pp. 49–58); Chromosome Numbers in Draba, by O. Heilborn (p. 59–68); A Homozygotic Lutescens-Form Obtained from *Oenothera suaveolens* Through Hybridization [trans. title], by O. Renner (pp. 69–80); Contributions to the Genecology of Glacial Relics, by G. Turesson (p. 81–101); The Frequency of Hybridization in Nature [trans. title], by J. P. Lotsy (pp. 113–125); Cytological and Experimental Studies in the Genus Lamium, by C. A. Jörgensen (pp. 126–136); The Influence of Locality on the Stability of Pure Lines [trans. title], by C. Fruwirth (pp. 145–156); Note on Some Characters in Ferns Subject to Mendelian Inheritance, by I. Andersson (pp. 157–

168); Somatic Segregation in a Barley Hybrid [trans. title], by S. Ikeno (pp. 193–198); The Seed Color in Hybrids of *Phaseolus vulgaris*×*P. multiflorus* [trans. title], by K. Tjebbes (pp. 199–208); A Heterozygous Phenotype in Shepherd's-Purse, by G. H. Shull (pp. 225–235); Studies on the Sexuality of Homothallic Mucors, by N. Nielsen (pp. 236–244); Non-Mendelian Inheritance in Viola, by J. Clausen (p. 245–256); Mathematical Characteristics of Pure Lines and Their Hybrids According to Studies on the Seed Weight of Beans [trans. title], by E. and A. Tschermak (pp. 257–273); On a Y-Linked Gene in Melandrium, by Ö Winge (pp. 274–284); Homoeotypic Division in Uninucleate Pollen Mother Cells, by O. Rosenberg, (p. 285–288); Contributions to the Genetics of Barley.—II, The Development of the Kernel Basis and Its Relation to Density, by H. and O. Tedin (pp. 303–312) (E. S. R., 55, p. 428); The Inheritance of Red Leaf Color in *Plantago major* [trans. title], by C. Hammarlund (pp. 313–320); Further Studies on Speltoid Chimeras in *Triticum vulgare* [trans. title], by Å. Åkerman (pp. 321–334) (E. S. R., 43, p. 534); A Sectorial Chimera in the Apple [trans title], by K. V. O. Dahlgren (p. 335–342); Contributions to the Genetics of *Brassica oleracea*, II, by K. B. Kristofferson (pp. 343–348) (E. S. R., 53, p. 630); The Production of Polyploid Gametes in Hybrids [Raphanus×Brassica], by G. D. Karpechenko (pp. 349–368); The Behavior of Partial Speltoid Mutations in Their Intercrosses [trans. title], by H. Nilsson-Ehle (p. 369–379); Hybridization Studies with Rape (*Brassica napus oleifera*).—I, Flower Color [trans. title], by N. Sylvén (p. 380–390); Morphological Restoration in Genetics [trans. title], by N. Heribert-Nilsson (p. 405–410); and Spontaneous Self-Pollination in Beta [trans. title], by C Hallqvist (pp. 411–418).

Isolation from foreign pollen in plant breeding [trans. title], J. Becker (*Pflanzenbau [Berlin], 2 (1926), No. 24, pp. 373–376, figs. 7*).—Apparatus designed to prevent accidental cross-pollination during breeding work with field crops and vegetables is described and illustrated.

Cytology of flowering plants, P. N. Schürhoff (*Die Zytologie der Blütenpflanzen. Stuttgart: Ferdinand Enke, 1926, pp. XI+792, figs. 282*).—The first section of this comprehensive work deals with the general cytology of the flowering plants, discussing in its chapters nucleus structure, mitosis, allotypic division, amitosis, multinucleated cells and nuclear coalescence, the physiology of the nucleus, and biological analysis and synthesis of the nucleus. The male and female gametophytes and fertilization phenomena of gymnosperms and angiosperms are treated at length, with discussion of the endosperm and the importance of cytology for classification. Part 2 is concerned with the special cytology of the flowering plants, the subject matter treating of the classes and subdivisions thereof pertaining to gymnosperms and angiosperms. An extensive bibliography is included.

Abnormalities in the pollen-tube growth in Datura due to the gene "tricarpel," J. T. Buchholz and A. F. Blakeslee (*Natl. Acad. Sci. Proc., 13 (1927), No. 4, pp. 242–249, figs. 12*).—The present contribution from the University of Texas and the Carnegie Institution describes the abnormal behavior in inheritance of tricarpel (*tc*), a recessive gene mutant of *D. stramonium*, and shows that an explanation can be found in a study of pollen tube behavior.

Nucleus and cytoplasm in relation to differential pollen-tube growth, R. A. Brink and C. R. Burnham (*Natl. Acad. Sci. Proc., 13 (1927), No. 4, pp. 238–242*).—Investigation at the University of Wisconsin demonstrated that the sugary gene of corn, shown by Emerson (E. S. R., 51, p. 335) to reside upon a different chromosome from the *Wx wx* pair, exerts a curious modifying action on the waxy ratio. Plants heterozygous for the waxy gene and homozygous

for sugary (*su su Wx wx*) give, when self-pollinated, a significantly lower proportion of waxy seeds than do *Su Su Wx wx* individuals. The direct cause of the deficiency of waxy seeds is believed to be a differential rate of growth of the two classes of male gametophytes, *su Wx* and *su wx*, arising from sugary homozygotes during the stage in which the pollen reserves are being used. In their later development it is assumed that the two types of pollen tubes elongate at the same rate.

Cytological and morphological investigations on gynodimorphic and normal forms of Ranunculus acris L., H. SOROKIN (*Genetics, 12 (1927), No. 1, pp. 59–83, figs. 67*).—These studies, reported from the University of Minnesota, were undertaken to determine whether certain morphological deviations from the typical vegetative and floral characteristics of *R. acris* are accompanied by variations from type in the nucleus.

Genetical and cytological investigations on Viola tricolor L. and V. arvensis Murr., J. CLAUSEN (*Hereditas, 8 (1926), No. 1–2, pp. 1–156, pls. 2, figs. 135*).—A comprehensive study of inheritance and chromosome constitution in Viola.

The relations between chromosomes and mutations in Oenothera lamarckiana, K. B. BOEDIJN (*Der Zusammenhang zwischen den Chromosomen und Mutationen bei Oenothera lamarckiana. Acad. Proefschr., Univ. Amsterdam, 1925, pp. VIII+173–261, figs. 32; also in Rec. Trav. Bot. Néerland., 22 (1925), No. 1–2, pp. 173–261, figs. 32*).—This is a University of Amsterdam thesis.

Secondary mutations of Oenothera lamarckiana [trans. title], H. DE VRIES (*Ztschr. Bot., 17 (1925), No. 4–5, pp. 193–211*).—A study of several mutants derived from previously obtained mutants named is indicated with conclusions.

A study of meiosis in Ranunculus acris, H. SOROKIN (*Amer. Jour. Bot., 14 (1927), No. 2, pp. 76–84, pls. 3*).—This contribution from the University of Minnesota deals with a 14-chromosome race of *R. acris*.

Chromosome counts in the varieties of Solanum tuberosum and allied wild species, H. B. SMITH (*Genetics, 12 (1927), No. 1, pp. 84–92, pl. 1, figs. 13*).—Cytological studies at the Maine Experiment Station and the University of Michigan showed that the haploid chromosome number is 12 for *S. jamesii* and *S. chacoense*, 24 for *S. fendleri*, and 36 for *S. demissum*, indicating that in these wild species of potato the haploid chromosome number is some multiple of 12, as has been reported for other species of Solanaceae. The McIntyre and McCormick cultivated varieties, characterized by a relatively high percentage of fertile pollen, were found to have a haploid chromosome number of 24 and no unpaired chromosomes. The appearance of haploid cells with approximately 48 chromosomes suggested that tetraploidy has occurred in the Early Ohio variety. The fact that the haploid chromosome number of the potato has increased from 12 to 48 apparently indicates that tetraploidy may have been a factor in the development of the cultivated varieties.

The chromosomes of Zea mays, E. L. FISK (*Amer. Jour. Bot., 14 (1927), No. 2, pp. 53–75, pls. 3*).—A more extensive account is rendered of studies at the University of Wisconsin on the chromosomes of corn (E. S. R., 54, p. 525).

The diploid number of chromosomes for all strains of *Z. mays* studied, except Black Mexican sweet corn, was 20. *Z. mays* agrees with other members of Maydeae in which chromosomes have been counted, except Tripsacum, in having 10 (or a multiple of 10) as the haploid number. Distinct indications of the pairing of homologous somatic chromosomes were found in the root tips. The variations evident in size of pairs of somatic chromosomes were sufficient so that individual chromosomes could be recognized with certainty. The number of bivalents in prophases of microsporogenesis and the haploid number of

chromosomes were found to be 10 in the starchy and sugar varieties of corn studied, except in Black Mexican. The greatest individuality in chromosome size and shape was observed in late diakinesis, and the maximum variation in size and shape of individual chromosomes was noted in Evergreen sweet corn.

Counts in the endosperm of Black Mexican and Evergreen sweet corn indicated a $3n$ condition, with 30 as the chromosome number. In one Black Mexican plant a variation of from 20 to 23 somatic chromosomes was found, the number in most counts being 22. Irregularities in chromosome number in microsporogenesis were found in several Black Mexican plants, the bivalents in a single plant varying from 9 to 11. Instances of nondisjunction in the heterotypic division in microsporogenesis were found in Golden Bantam sweet corn, the resulting daughter cells containing, respectively, 11 and 9 chromosomes.

Inheritance of trimorphism in Lythrum salicaria, E. M. EAST (*Natl. Acad. Sci. Proc., 13 (1927), No. 3, pp. 122–124*).—This is a contribution from Harvard University.

Preliminary studies on the absence of yellow colour in fatuoid or false wild oats, E. T. JONES (*Welsh Jour. Agr., 3 (1927), pp. 221–231*).—Studies on the F_1, F_2, and F_3 of hybrids between pure line descendants from a white-grained fatuoid (which arose in Golden Rain (*Avena sativa*) oats) and Golden Rain oats suggested that the loss of color on ripening should be regarded as a phenomenon entirely separate from an inhibitory effect due to the presence of the fatuoid complex or of some associated factor. The white color was dominant over the yellow with monofactorial segregation in F_2, although the usual degree of dominance of the sativa over the fatuoid type of grain was observed. There was no independent segregation for color, and yellow was fully expressed only in the absence of the fatuoid character.

Heredity in the pea [trans. title], J. STÁDNÍK (*[Czechoslovakia] Min. Zeměděl., Sborn. Výzkumn. Úst. Zeměděl. No. 15 (1926), pp. 77, pls. 2, figs. 2; Fr. abs., pp. 74, 75*).—Herein are presented the results of a genetical analysis of the flowers and fruits of the garden pea.

Malformations in the fruits of the tomato and other solanums [trans. title], H. PAPE (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1926), No. 4, pp. 567–587, pls. 2*).—The results of a study of the nature, cause, and heritability of abnormal growths in the tomato and other solanaceous fruits are presented. Plants grown at the Berlin-Dahlem Experimental Station from seeds taken from Lucullus tomato fruits which were characterized by abnormal shape yielded in turn 10 per cent of abnormal fruits, while other ordinary stocks of the Lucullus variety grown in the same field were wholly normal. Comparable results were obtained the succeeding year, leading to the practical suggestion that tomato seeds should be saved from plants bearing all normal fruits.

A sectorial chimera in the apple [trans. title], H. LAMPRECHT (*Hereditas, 8 (1927), No. 3, pp. 351–358, figs. 2*).—A striking resemblance was noted in color and appearance of the skin between a sectorial chimera in a Cox Pomona apple and that of normal Ribston Pippin fruits. Transpiration records taken upon this foreign sector and a comparable normal section, both with cut surfaces carefully sealed with tin foil, showed a much more rapid water loss (2½ times) in the foreign sector. Anatomical studies of the skin and the underlying cells showed no important structural differences except that the wax coating was much thicker on the normal skin. Removal of the wax by ether resulted in practically equal transpiration. The differences in transpiration between sectors taken from normal Ribston Pippin and Cox Pomona fruits were comparable to the differences obtained between the abnormal and normal sectors.

In respect to dry substance the foreign and normal sectors contained 20.48 and 16.17 per cent, respectively, differences comparable to those found in the regular varieties. Total sugars were lower, and raw protein, raw fiber, and ash were higher in the foreign than in the normal sector, and again like differences were found between the regular varieties. Inasmuch as Cox Pomona originated as a seedling of Ribston Pippin and reciprocal crosses between the two have proved sterile, the author believes that the two varieties are much alike hereditarily and that the nature of the chimera might not be altogether unexpected.

A suggested interpretation of certain cases of anisogeny, R. J. CHITTENDEN and C. PELLEW (*Nature* [*London*], *119* (*1927*), *No. 2983, pp. 10, 11, fig. 1*).—In crosses between Tall and Procumbent races of flax (E. S. R., 48, p. 28), male sterility occurs in F_2 and is inherited as a simple Mendelian recessive. It appears when Procumbent is the female parent in the original cross but not in F_1 or F_2 of the reciprocal Tall×Procumbent. Male sterility, then, only appears when there is cytoplasmic continuity from Procumbent.

The authors suggest that this difference in inheritance is due to dissimilarity in the cytoplasms of Procumbent and Tall. Individuals of F_1 and later generations resulting from Procumbent×Tall would have cytoplasm from Procumbent, whereas the progeny of the reciprocal cross would have Tall cytoplasm. Though a particular Procumbent gene or group of genes reacts normally in both cytoplasms, the corresponding factor or factors in the Tall when homozygous in Procumbent cytoplasm gives rise to male steriles. This is shown diagrammatically.

Bread moulds and biochemical differences between sexes, A. F. BLAKESLEE (*Science*, *63* (*1926*), *No. 1637, p. 505*).—Investigations by the author and S. Satina are said to show that males and females of higher and lower plants have average differences in response to biochemical tests, the female usually being the more active chemically. It was found in the investigations that over 90 per cent of correct identifications had been obtained in different groups by using this test. The + sex of bread molds was found to react biochemically like females and the — sex like males of higher plants and animals.

Inheritance in Brahman and Hereford cattle (*Texas Sta. Rpt. 1926, pp. 23, 24*).—Studies of the conformation and feeding qualities of crossbred steers and back-cross (to Hereford bulls) steers have shown that the latter are in general intermediate between the crossbred and Hereford steers in feeding and killing qualities, but are heavier than either. The crossbreds do not gain as rapidly as Herefords, but part of the extra gain of the latter is due to paunch and intestine, the dressing percentage of the crossbreds being higher, though the carcass shape is less desirable to the average butcher. The advantages of the Brahmans are their hardiness, ability to thrive in hot weather and move about more quickly and easily, and their higher dressing percentage. The disadvantages are their wildness, undesirable shape of carcass, and their susceptibility to cold weather.

FIELD CROPS

Student's method as applied to field data covering a period of years, W. H. SACHS (*Jour. Amer. Soc. Agron.*, *18* (*1926*), *No. 12, pp. 1064–1067*).—Although Student's method may be valuable as a means of studying replications of paired plats during one year, the author considers that the indiscriminate use of this method in connection with field data collected over a period of years may lead to serious errors.

Forage crops and their culture in northern Nebraska and the Dakotas, S. Garver (*U. S. Dept. Agr., Farmers' Bul. 1511 (1927), pp. II+46, figs. 14*).—The cultural needs and management practices for important legumes, grasses, fodder and silage crops, and miscellaneous forage crops variously grown for hay, pasture, and seed in the region indicated are outlined, with comment on the place of cultivated forage crops in the cropping system and preparation of the seed bed. The importance of good seed is emphasized.

[Field crops investigations in Ohio] (*Ohio Sta. Bul. 402 (1927), pp. 26, 28–34, 45, 65–67, 112, 113, 116, 117, fig. 1*).—Continued experimental work with field crops (E. S. R., 55, p. 132) comprised crop rotations, variety tests and breeding work with corn and wheat, fertilizer trials with wheat, storage and planting tests with potatoes (E. S. R., 56, p. 337), seed bed and fertilizer tests with tobacco, and studies on woodland pasture (E. S. R., 55, p. 528). The relative merits of barley and spring wheat are shown in comparison with oats.

When applied at acre rates of 100, 200, 300, and 400 lbs. at four positions with respect to inoculated soy bean seed, over 100 lbs. of either 0–10–10 or 0–14–4 fertilizer or 200 lbs. of 16 per cent acid phosphate placed with the seed reduced germination, and 300 or 400 lbs. were decidedly harmful. Of the plants that grew, 70 per cent with acid phosphate and 15 per cent with 0–10–10 were inoculated with 3 to 5 nodules per plant, the 0–14–4 being intermediate with regard to toxicity. These materials in quantities up to 400 lbs. per acre placed below, above, or at the side of the seed did not reduce germination, and from 80 to 100 per cent of the plants were inoculated and had 15 to 20 large nodules per plant. The heavier applications gave more nodules per plant and more inoculated plants.

A study of methods of testing cereals demonstrated that conclusions based on a comparison of single plantings, either plats or fields, are of little value. Comparisons based on only one year of work may be misleading. The use of checks, i. e., systematically distributed plats of uniform seeding and treatment with which the trial plats are compared, is of significant value in gaining reliability among larger field plats, although of doubtful worth in nursery trials. Intervarietal competition did not seem a factor of importance disturbing the results of single row nursery tests in small grains where rows are 1 ft. apart and adjoining varieties are not markedly contrasted in vigor of growth. A given area devoted to replicated small plats will give far more reliable results than single large plats. Lengthening plats is relatively more effective in gaining reliability than increasing them in width.

Storage experiments with potatoes showed that ventilation may aid in lowering the temperature in the fall to the desired point but is unnecessary while storage temperatures remain below 40° F. Ventilation in the spring may aid in keeping the storage cool. Fresh air is essential when the temperature rises to the point where sprouting begins.

Calcium arsenite was the most efficient of five herbicides applied to Canada thistle. It might be used satisfactorily when other control measures are not feasible, although chemicals did not appear economical for large infested areas.

Report of experiments at Granite Reformatory (*Oklahoma Sta. Bul. 161 (1927), pp. 8*).—Experiments under the supervision of R. E. Ellithorp at Granite, in southwestern Oklahoma, reported on briefly, included variety tests with cotton, grain sorghums, sorgo, corn, wheat, oats, barley, soy beans, cowpeas, and miscellaneous root crops; cultural tests, including planting and spacing trials with cotton, grain sorghum, wheat, barley, oats, and sweet clover; a fertilizer trial with cotton; and a fertility test with wheat.

A select list of varieties of farm crops, C. A. MOOERS (*Tennessee Sta. Circ. 10 (1927), pp. 4*).—Varieties of alfalfa, barley, clover, corn, cotton, cowpeas, grasses, lespedeza, millet, oats, peanuts, rape, rye, sorgo, soy beans, sunflowers, tobacco, vetch, and wheat outstanding in tests by the station are indicated, with approximate harvest dates and other notes.

Rates and dates of planting for Tennessee farm and garden crops, C. A. MOOERS (*Tennessee Sta. Circ. 11 (1927), pp. 8, fig. 1*).—Planting dates and rates are suggested for general farm crops, crop mixtures, and vegetables.

[Field crops investigations in Texas] (*Texas Sta. Rpt. 1926, pp. 34, 35–40, 41, 42, 43–45, 66, 68, 72, 75, 82, 83*).—Experiments reported on from the station and substations included variety trials with corn, oats, winter and spring wheat, grain sorghums, rice, cotton, alfalfa, cowpeas, potatoes, and miscellaneous grasses and legumes; inheritance studies with cotton (E. S. R., 57, p. 36) and grain sorghum; breeding work with oats, wheat, rice, and peanuts; crop rotations; and various tillage and cultivation tests. Noteworthy among the new varieties are Nortex oats, Denton wheat, Texas Fortuna rice, Westex cotton, and Chiltex and Premo grain sorghums derived in cooperation with the U. S. Department of Agriculture from kafir×feterita.

Rotations have generally produced considerably larger yields than continuous cropping. For the period 1915–1925 at Lubbock, the work indicated that fallow is unnecessary in the agriculture of the region, and that so far sorgo as a green manure has not been profitable. The most practicable cropping system appears to provide for the alternate cropping of cotton and grain sorghums, using the manure and crop residues available.

The lint percentage of Startex cotton has been increased from about 32 to 37 per cent without affecting other desirable characters. Significant positive correlation was observed between seedling vigor and yield of lint cotton. Summarized data continued to show that the Mebane, Lone Star, Truitt, and Acala types of cotton are best adapted to conditions in Texas, with more or less local adaptation.

Fertilizer tests with rice at Beaumont showed that 100 lbs. per acre of ammonium sulfate has been the most profitable treatment. Acid phosphate alone or with ammonium sulfate did not increase yields. The best results were had when fertilizers were applied about 6 weeks after planting.

The effects of 10 generations of inbreeding within 8 pure lines of kafir were to reduce materially the variability of all characters measured and the establishment of individuality without apparent loss in vigor and production in these lines through their approach to homozygosity. Multiple correlation between 11 head and plant characters and grain production gave coefficients of 0.934±0.003 calculated on population material and 0.926±0.009 on line bred material, indicating that characters bearing on production, other than the many considered, remain to be dealt with. Crosses between closely related varieties or forms, e. g., Blackhull kafir×Red kafir, Dwarf milo×Standard milo, and Dwarf feterita×Standard feterita, were accompanied by little or no heterosis as shown by plant height, whereas in crosses between widely differing forms, e. g., kafir×milo and milo×feterita, marked hybrid vigor was expressed in both F_1 and F_2. The data suggested that inheritance of number of seed branches in kafir may be simple, but that inheritance of some of the other head characters is complex, involving qualitative inheritance.

Viscosity and winter hardiness in the small grains, H. M. TYSDAL and S. C. SALMON (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1099, 1100, figs. 2*).—Investigation at the Kansas Experiment Station involving 12 varieties of wheat, a winter rye, and a winter barley showed that in the comparison of varieties

high correlation existed between winter hardiness on the one hand and the moisture content of the tissue ($r=-0.7950\pm.0766$), quantity of press juice ($-0.4735\pm.1617$), and viscosity of the press juice ($+0.8330\pm.0623$) on the other. With rye collected at various times during winter and early spring a close correlation was noted between the temperature immediately preceding the determination and the moisture content of the tissue, also between the temperature and press juice and between the temperature and viscosity of the press juice. Very little correlation was observed between the temperature 10 days or more before the determinations and the viscosity and the quantity of press juice. In general the correlation was high for a period of 6 days or less.

The longevity of legume bacteria on inoculated alfalfa seed, A. G. Lochhead (*Sci. Agr., 7 (1927), No. 5, pp. 179–184, fig. 1*).—Alfalfa seed inoculated with a culture of *Bacillus radicicola* at the Central Experimental Farm at Ottawa retained on their seed coats for 6 months viable organisms capable of producing root nodules. Although the effect of inoculation was plainly noticeable after 6 months' storage, maximum nodule formation was only obtained wtih freshly inoculated seed. Nodule-forming capacity appeared to decrease more rapidly during the first week of storage and more gradually thereafter. Even after 24 hours' storage a decrease in nodule-forming power was indicated, accompanied by a sharper decline in the number of colonies of *B. radicicola* appearing on plates of modified Ashby's agar.

Storage at a moderately low, even temperature (in a refrigerator at 3 to 5° C.) appeared to favor nodule formation more than ordinary room temperature. The fluctuating, low outside temperatures during the winter months appeared to affect adversely the nodule-forming capacity of the seed. Inoculating seed by moisture with a suspension of the culture in sweetened skim milk was found superior to inoculation by mixing inoculated sand with the seed.

Alfalfa and sweet clover culture, C. A. Mooers (*Tennessee Sta. Circ. 12 (1927), pp. 2*).—Suggestions, based on experiments and trials by the station, are outlined for the culture and management of alfalfa and sweet clover.

The variability of some populations and vegetative lines of Agrostis stolonifera L. [trans. title], F. Splechtner (*Ztschr. Pflanzenzücht., 10 (1925), No. 2, pp. 69–127, figs. 12*).—The vegetative and reproductive organs in *A. stolonifera* are described in detail from studies at the State Botanical Institute at Hamburg, and their interrelations, variability, and response to environmental conditions are discussed. The difficulty of classifying the species on the basis of morphological and anatomical characters is indicated. Extensive measurements on plant organs were recorded from plants in pure lines and also from plants in mixed populations grown under different environmental conditions in southern Germany.

A study of germination, maturity, and yield in corn, T. K. Wolfe (*Virginia Sta. Tech. Bul. 30 (1927), pp. 35, fig. 1*).—The relation of kernel characters of corn to germination and to maturity and yield under particular environmental conditions was investigated with the Silver King variety.

Under field conditions kernel characters were not found to be related conclusively to time of germination, whereas in the laboratory with kernels from the same ear small narrow kernels of small volume and high specific gravity germinated before large wide kernels with large volume and low specific gravity. No consistent relationship existed between time of germination and length, thickness, and type of indentation of the kernels.

With the soil moisture held at 30, 40, 50, 60, 70, and 80 per cent of saturation little, if any, influence of soil moisture was noted on the relationship

between kernel characters and rapidity of germination. Germination tests in soil held at from 10 to 120 per cent of saturation showed the optimum to lie between 70 and 80 per cent. On Hagerstown silt loam soil held at 50 and 60 per cent of saturation, 35° C. (95° F.) seemed more favorable for germination than 30 or 25°. Kernel characters tended to be more closely correlated with time of germination under greenhouse conditions at high than at low temperatures. The results obtained indicated that under field conditions selecting well developed kernels for planting is sound practice.

Kernels from the tip, middle, and butt of the ear tended to germinate in the order given. Small kernels from these respective positions germinated faster than large kernels from the same locations on the same ear. Physiological activities of small kernels were more rapid than of large kernels. Small and large kernels had similar relative proportions of different parts, i. e., skin and tip cap, germ, soft starch, and horny starch, and did not differ greatly in chemical composition.

The results of field trials showed slight relationship between kernel characters and yield. Plants of Silver King corn which yielded high generally tasseled, matured pollen, and silked early. Tasseling, pollen anthesis, and silking are suggested as indicators of relative final maturity.

Seminal root development in corn in relation to vigor or early growth and yield of crop, L. H. SMITH and E. H. WALWORTH (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1113–1120, fig. 1*).—Observations at the Illinois Experiment Station on the development of the seminal roots on corn in a number of varieties showed that great variation exists in the number of secondary seminal roots produced in different seedlings. Individual ears seemed to possess characteristic tendencies in this respect, and varietal differences were also noticeable. A positive correlation was found between high (average 4.32 in contrast to low, 2.43) seminal root production and yield of crop, and there was also some evidence that high seminal root production tends to enhance vigor of early growth. It is suggested that observation of seminal root production during germination tests may aid in selecting seed ears of higher productiveness.

Yield and the number of seminal roots in maize, G. N. COLLINS (*Jour. Amer. Soc. Agron., 19 (1927), No. 5, pp. 466, 467*).—A critical discussion of the interpretation of the results of the above study.

Seminal roots in corn, L. H. SMITH (*Jour. Amer. Soc. Agron., 19 (1927), No. 5, pp. 467–469*).—A reply to Collins.

The rate of utilization of nitrogen as ammonium sulfate by corn in hill fertilization studies with 2–12–2 fertilizer, F. B. SMITH and H. J. HARPER (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1083–1087*).—The rate at which corn plants use nitrogen from ammonium sulfate when applied in the hill in the same level with the seed, together with acid phosphate and potassium chloride in quantities per acre equivalent to 100 and 200 lbs. of a 2–12–2 fertilizer, was studied at the Iowa Experiment Station.

In 8 weeks after application nearly all of the nitrogen added had been taken up by the corn. At that time the difference between the quantities of nitrogen in the fertilized and unfertilized plants was several times greater than the quantity of nitrogen applied to the fertilized plants, indicating that the root systems of the fertilized plants were considerably larger than those of the untreated plants.

Influence of cowpea crop on yield of corn, C. A. MOOERS (*Tennessee Sta. Bul. 137 (1927), pp. 18, figs. 7*).—Experiments in a two-year rotation on gravelly dolomite soil at the station and on Chickamauga limestone soil south of Knoxville indicated that turning under cowpeas or soy beans to increase soil

productivity, as measured by the next year's corn crop, is unprofitable. However, a condition much better than average is to be expected where the legumes are pastured or fed as hay and the manure returned. Even when the summer legume is removed as hay, more corn is possible than where corn follows corn, although the effect is small compared with those after red clover and alfalfa. Liming was always followed by increased corn crops. The effects of cowpeas and soy beans planted with corn are recorded below.

Effects of planting soybeans and cowpeas with corn, C. A. MOOERS (*Tennessee Sta. Circ. 13 (1927), pp. 2*).—Both soy beans and cowpeas materially reduced the average yieds of corn when panted therein, but the soy bean yield nearly offset the decrease in corn. The data seemed to favor the mixture of soy beans with corn. Trials at the West Tennessee Substation showed that the cowpea crop from broadcasting at the last cultivation of corn is uncertain but not detrimental to the corn yield.

Cotton and its production, W. H. JOHNSON (*London: Macmillan & Co., 1926, pp. XXVII+536, pls. 17, figs. 9*).—This book reviews the history of cotton production, summarizes the botanical relationships and characters of the crop, and describes the salient characteristics, status, and prospects of cotton production in the United States, Egypt, Brazil, China, Russia, India and other divisions of the British Empire, and in minor cotton-growing countries. The general principles of cotton cultivation are outlined, and discussion is devoted to handling and marketing the crop, the manufacturer's viewpoint, improvement methods, diseases, insect pests, and cotton by-products.

Cotton-spacing experiments at Greenville, Texas, H. C. MCNAMARA (*U. S. Dept. Agr. Bul. 1473 (1927), pp. 48, pls. 2, figs. 19*).—Spacing experiments during the period 1921–25, inclusive, with Lone Star cotton, largely on Houston clay and grown under rather dry seasonal conditions, gave results showing the larger yields from the closer spacings. Unthinned plants, 2 to 4 in. apart, and 6-in. spacing generally outyielded 12-in. spacing. Where hills were more than 1 ft. apart, several stalks per hill made more cotton than one stalk per hill. Chopping seemed more likely to reduce than to increase yields. Close spacing gave indications of being more advantageous on light soils, e. g., fine sandy loam, than on heavy soil, such as the black land.

Close spacing reduces the size of plant, permits more stalk in the row without crowding, and promotes the setting of early bolls. Percentage and length of lint did not seem to be affected by close spacing, although the size of bolls was slightly reduced. The greater exposure of the land to sunlight and the fact that closly spaced plants can be poisoned more effectively may be of help in boll weevil control.

Effect of fertilizers on the fruiting activities of cotton plants, J. D. WARNER (*Jour. Amer. Soc. Agron., 18 (1926), No. 11, pp. 1045–1050*).—Fruiting studies made in connection with fertilizer experiments at the South Carolina Pee Dee Substation showed that cotton on plats receiving nitrogen and potassium without phosphorus fruited slowly during the first part of the season and reached the peak late. Phosphorus and potassium without nitrogen resulted in early season fruiting. While the fourth week was the most productive, there were only two weeks of rapid fruiting. Although phosphorus and nitrogen used alone stimulated early season fruiting, the period of rapid fruiting appeared to be comparatively restricted through the omission of potassium. A plat receiving a complete (8–4–4) fertilizer at the acre rate of 1,000 lbs. fruited early in the season and covered 3 weeks of rapid fruiting, indicating that the plant food was well balanced.

Notes on the constitution of an unimproved cotton crop, B. G. C. BOLLAND (*Ann. Appl. Biol., 13 (1926), No. 2, pp. 266–276, figs. 3*).—This paper reports the

formation of the Cotton Service in the State of Ceará, Brazil, projected improvement methods, and data on plant, boll, seed, and lint character of the crop prior to selection. Tests by E. Lanigan on fibers from samples of the 1925 crop are appended.

Mineral constituents of the cotton plant, J. S. McHargue (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1076–1083*).—This contribution from the Kentucky Experiment Station describes the results of analyses made on Mississippi-grown cotton plants taken at random during early October after the first picking.

Small quantities of copper, manganese, and zinc are shown to occur in the different parts of the cotton plant, and additional data are reported concerning the quantities of calcium, magnesium, potassium, sodium, phosphorus, sulfur, and nitrogen in the principal parts of the plant. In so far as conditions are comparable, the results for the common fertilizer constituents are said to be in accord with those reported by White (E. S. R., 34, p. 139) and Fraps (E. S. R., 42, p. 530).

Community production of Acala cotton in the Coachella Valley of California, H. G. McKeever (*U. S. Dept. Agr. Bul. 1467 (1927), pp. 48, pls. 5, figs. 2*).—The development of a one-variety community in the Coachella Valley of California from a mixed variety condition is reviewed, with accounts of the difficulties met with and how they were surmounted. The production and distribution of improved seed and the protection of the industry by legislation are discussed at length, and a list of publications on community cotton improvement is included.

Preservation and improvement of the quality of Egyptian cotton [trans. title], V. M. Mosséri (*Égypte Contemporaine, 17 (1926), No. 96, pp. 393–433; also in Bul. Union Agr. Égypte, 25 (1927), No. 177, pp. 43*).—This review cites the causes of the decline in the yield and quality of Egyptian cotton, and discusses the remedial methods and results obtained therewith by different research agencies.

Gossypium, G. Watt (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 5 (1926), pp. 193–210*).—A classified enumeration with brief diagnostic descriptions is given of certain species of cultivated and wild cottons, specimens of which are preserved in the herbaria of the Royal Botanic Gardens of Kew and Edinburgh.

Regulations governing the grading, baling, marking, and description of Philippine fibers, S. Youngberg (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 217–235, figs. 2*).—These regulations are concerned with abaca, canton, pacol, and retted and knife or machine cleaned maguey and sisal.

An agricultural study of flax.—I, The saving of seed, G. O. Searle (*Linen Indus. Research Assoc., Research Inst. Mem. 33 (1926), pp. 73–81, pls. 2*).—The practice used in the Baltic States of pulling flax early, cutting the seed bolls and branches therefrom, proceeding with retting the green flax as usual, and storing the bolls and branches in fencelike frames in the open air for maturing and drying was studied. Retting, scutching, and hackling tests showed that the removal of the seed bolls and branches before retting had little if any effect on the quality of the fiber. Seed saved in this manner was of high quality and suitable for planting.

Flaxseed: Abstracts and list of references of published reports . . ., compiled by C. L. Phillips (*U. S. Dept. Agr., Bur. Agr. Econ., 1927, pp. [2]+37, figs. 4*).—This mimeographed bibliography gives abstracts of official publications on the uses, oil values, grading, dockage, production, and marketing of flaxseed, and includes a selected list of references on flaxseed and linseed oil.

A phytotechnical study of a useful wild Brazilian plant, J. S. GUIMARÃES (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 2, pp. 241–250, pl. 1, fig. 1*).—The gravitaia (*Hypoxis tuber brasiliensis*), a forage plant bearing edible sweet tubers, is described, with notes on its botanical relationship, uses, tuber characteristics, cultural tests, and diseases and insect pests.

[Kapok] (*Philippine Agr. Rev., 19 (1926), No. 3, pp. 185–205*).—These pages include the following articles: Kapok in the Philippines; The Kapok Industry of Java, by V. C. Bartolome; and A Catechism on Kapok Culture, by J. M. Ejercito.

Self and cross-fertilisation in Lolium perenne L., T. J. JENKIN (*Jour. Genetics, 17 (1926), No. 1, pp. 11–17*).—In a study of the seasonal productivity of *L. perenne* plants obtained by self- and by cross-fertilization at Aberystwyth, Wales, cross-fertilizing gave an increase in productivity ranging from 37 to 224 per cent. Some crosses appeared to produce families which suffer only slightly by frequent and continuous cutting (resembling continuous grazing), while other families give far better results when early cuts are omitted (similar to hay conditions).

Further studies of the pollination of orchard grass, T. K. WOLFE and M. S. KIPPS (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1121–1127*).—Supplementing previous work at the Virginia Experiment Station (E. S. R., 54, pp. 532, 638), information is given on the pollination of orchard grass and on the influence of self-pollination on the size of seed and on the production of chlorophyll-deficient seedlings.

Contrary to the earlier results, cotton cages were better than paper bags for self-pollinating. The percentage of flowers setting plump seeds when open-pollinated ranged from 21.3 to 55.4, close-pollinated 0.3 to 37.3, self-pollinated by inclosing one head in a paper bag 0.9 to 21.6, and self-pollinated by inclosing a single plant in a cotton cage 8.2 to 35.7. The respective average percentages of seed set under these conditions were 43.24, 9.3, 8.84, and 20.89. Open-pollinated seed weighed more than either close- or self-pollinated seed, which weighed practically the same. Some clonal lines when self-pollinated produced more chlorophyll-deficient seedlings than others, and more of such seedlings were produced with self-pollinated seed than with open-pollinated. The occurrence of etiolated seedings in open-pollinated seed probably results from a certain amount of self-pollination taking place under field conditions.

Soy beans: Culture and varieties, W. J. MORSE (*U. S. Dept. Agr., Farmers' Bul. 1520 (1927), pp. II+34, figs. 10*).—This supersedes Farmers' Bulletin 973 (E. S. R., 39, p. 640), bring up to date information on soy bean varieties and their adaptation, production practices, and diseases and insect pests.

The flowering of sugar cane in Hawaii, C. C. BARNUM (*Hawaii. Planters' Rec., 30 (1926), No. 3, pp. 382–399, figs. 14; abs. in Facts About Sugar, 21 (1926), No. 45, p. 1063*).—Extensive studies on the flowering of sugar cane, with particular reference to time of day and meteorological conditions, gave indications that normal flowering depends on high relative humidity, i. e., 80 to 90 per cent. Rainfall does not hinder flowering but does inhibit pollen discharge so long as the flowers are saturated with water. No flowers were found to open before midnight either on exposed tassels or on those kept in the laboratory. Tassels of D. 1135, which were used as standards, continued to open flowers from midnight until 7 a. m. during the flowering period of the individual tassel. The most flowers opening on single tassels during the nights of observation opened between 8 and 7 a. m. Heavy pollen casts of D. 1135 could be obtained between 2 and 6 a. m.

Pollen dehiscence is said to be usually coincident with flower opening. Single flowers have been observed to open, the discharged pollen to make contact with the stigma, germinate, and the germ tube to penetrate the stigmatic surface sufficiently to resist dislocation with dissecting instruments, all within a 15-minute period. D. 1135, Badila, H. 109, and occasionally Uba and N. D. 1 appeared to be self-fertile, having complete flowers with mature pollen. Tip canes, Lahaina, striped Mexican, and Yellow Caledonia were not found self-fertile. In self-fertile varieties dehiscence could be retarded by frequent sprinkling during flower emergence, and it appeared possible to induce crossing of two strongly self-fertile cane varieties by using this method. Photomicrographs of sugar cane flowers are supplemented by photographs of typical Hawaiian-grown commercial cane tassels.

Progress report of sugar cane pollen studies, D. M. Weller (*Hawaii. Planters' Rec., 30 (1926), No. 3, pp. 400–414, figs. 4; abs. in Facts About Sugar, 21 (1926), No. 45, p. 1063*).—This is a progress report of an extended investigation dealing with the amounts of pollen shed, its viability, shedding period, and environmental factors influencing pollen formation in sugar cane, and viability. Methodology is discussed at some length.

Temperature and humidity definitely affect germination percentages of cane pollen. The optimum temperature appeared to be 22° C., (71.6° F.) and at this temperature the maximum number of germinations occurred at 96 per cent relative humidity. The percentage of pollen germination of cut tassels decreased from 5 or 6 per cent on the first day after the tassel was cut to a fraction of 1 per cent on the third or fourth day. A higher percentage of viable pollen is shed from growing than from cut tassels, and it is shed for a longer period. The maximum viable pollen shed from growing tassels was 15 per cent, as compared with 5.7 per cent from cut tassels.

Hand stripping of cane seed, A. H. Rosenfeld (*Facts About Sugar, 22 (1927), No. 2, p. 42, fig. 1*).—Stripping the dried cane leaves from sugar cane seed pieces before planting did not give sufficient advantages in yields over unstripped cane during four crops at the Tucumán, Argentina, Sugar Experiment Station to warrant the practice. The weights of the resultant stalks were similar, and no outstanding effect of stripping was observed in the sugar content or purity of the juices.

Comparative value of scarified and of unhulled seed of biennial white sweet clover for hay production, T. K. Wolfe and M. S. Kipps (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1127–1129*).—In comparative plantings at the Virginia Experiment Station made with adjusted rates on dates between August 1, 1925, to April 15, 1926, the stand and hay production indicated the superiority of unhulled biennial white sweet clover seed to scarified seed.

Effect of time of irrigation on production of crude protein in wheat, A. Kezer (*Cereal Chem., 3 (1926), No. 5, pp. 340–342*).—At the Colorado Experiment Station wheat receiving 1 in. of water at planting and 6 in. at one of the growth periods averaged during 5 years for irrigation at germination 20.09 per cent of protein, tillering 20.67, jointing 20.51, heading 20.31, blossom 20.47, and filling 20.28 per cent, and when given 1 in. at each of these periods 20.23 per cent. While the production of protein was higher for irrigation at the earlier growth periods, the best quality of protein and the best quality of wheat were produced with irrigations at the heading and blossoming periods.

The critical period of applying irrigation water to wheat, A. Kezer and D. W. Robertson (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 80–116, figs. 8*).—When Marquis wheat, protected from precipitation at the Colorado Experiment Station, was irrigated at the periods and in the amounts indicated above, water

applied at jointing increased the yield of straw and grain but not the grain quality as indicated by bushel weight and weight per 1,000 kernels. Water applied at heading resulted in slightly lower yields of grain and straw than water applied at jointing. However, the quality of grain was materially improved. Irrigation as late as blossoming and filling influenced yields of grain or straw very little but markedly affected grain quality as indicated by bushel weight. Irrigations at the heading, blossoming, and filling stages were not entirely used by the current crop, part of the water being available for the next crop. Early irrigations at germination and tillering increased the straw yield more than the grain yield but produced grain of poor quality. One-in. irrigations distributed through the growing season gave the best results, although they are deemed impractical. Results in potometers did not agree with those obtained under field conditions.

Density of wheat as influenced by freezing, stage of development, and moisture content, P. F. Sharp (*Cereal Chem., 4 (1927), No. 1, pp. 14–46, fig. 1*).—Investigations at the Montana Experiment Station gave evidence that the density of wheat, grown under uniform conditions and harvested at various stages of maturity, does not differ to any great extent, provided the wheat is desiccated under approximately uniform conditions and is not affected by different amounts of yellow berry or by great differences in protein content. Light freezing in itself did not seem to affect the density of wheat markedly, whereas severe freezing, at the immature stages as employed in the experiments reported, caused an increase in density. The moisture content and moisture history appeared to exert a marked effect upon the density of wheat. It was shown that different samples of wheat may exhibit marked differences in the ability of the kernels to contract on the removal of moisture when the wheat has once been air dried and then increased in moisture content. "The inability of wheat which has been desiccated in the field to a corneous condition and subsequently subjected to damp weather conditions to decrease again to its original volume on the removal of the water results in starchy kernels and produces wheat which is called 'bleached.'" Other than the possibility of kernel size, factors which affect the density of wheat include moisture content and moisture history, protein content, and protein quality.

A superior new wheat for western agriculture, C. H. Briggs (*Cereal Chem., 3 (1926), No. 5, pp. 343–351*).—Milling and baking tests made on a pure line selection (No. 24) of Early Baart wheat (E. S. R., 48, p. 232) at the Howard Laboratory showed it to be of merit as a superior bread-making wheat for western arid and semiarid conditions. Factors contributing to the high value included its heritable high quality, the fertile soil, and the climate and irrigation involved.

Wheat improvement in England (*Milling, 67 (1926), No. 26, pp. 794–797*).—An appreciation by J. H. Parker of the wheat breeding work of R. H. Biffen of the Plant Breeding Station at Cambridge.

Milling and baking tests with wheat varieties [trans. title], M. P. Neumann (*Landw. Jahrb., 63 (1926), No. 1, pp. 129–144, figs. 3*).—The results of milling and baking tests with 21 varieties of wheat grown in Germany in 1924 are shown in comparative tables.

Seed certification in Germany in 1925 [trans. title], W. Edler (*Mitt. Deut. Landw. Gesell., 41 (1926), Nos. 37, pp. 758–767; 38, pp. 786–793*).—Supplementing a report for 1922 (E. S. R., 50, p. 439), there are tabulated for the several divisions of Germany the areas of varieties and selections of cereals and legumes grown for seed and inspected for certification in 1925. The tables indicate totals of 61,097 hectares (150,910 acres) of 60 sorts of winter rye,

3,344 hectares of 3 sorts of spring rye, 32,509 hectares of 137 sorts of winter wheat, 5,345 hectares of 38 sorts of spring wheat, 7,312 hectares of 27 sorts of winter barley, 32,177 hectares of 113 sorts of spring barley, 74,878 hectares of 124 sorts of oats, 4,612 hectares of 53 sorts of peas, 964 hectares of 42 sorts of field beans, 1,493 hectares of 22 kinds of lupines, 85 hectares of 4 vetches, and 3.5 hectares of 2 lentils.

Effect of alternate freezing and thawing on the impermeability of alfalfa and dodder seeds, A. R. Midgley (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1087–1098*).—Germination studies were made at the Utah Agricultural College on variously treated composited alfalfa seed obtained from growers in Duchesne County, Utah. See also an earlier report by Stewart (E. S. R., 56, p. 433).

After the first freezing, which reduced the number of impermeable alfalfa seeds about 23 per cent on the average, subsequent freezing and thawing seemed to have little influence in diminishing the number of such seed. Intensity of freezing did not effect any reduction in the impermeability, 0° C. being fully as effective as −20°. When kept moist for several months as many seeds germinated without freezing as in a similar sample frozen weekly during the same period, indicating that freezing only expedited the process. Alfalfa seed becomes permeable with age even when left dry, but very slowly, however, if stored with little or no variation in room temperature.

Freezing the seeds in a dry condition seemed as effective as when the seeds were wet, especially for the first freezing. The duration of freezing seemed without influence on germination. As many seeds became permeable and germinated after 1 hour of freezing as in a similar sample frozen for 60 days. The duration of thawing with subsequent freezing had little influence in producing permeable seed, whereas the longer the thaw lasted the greater was the number of seeds killed with subsequent freezing. Apparently seeds becoming permeable with one freezing are killed by the next.

The number of impermeable seeds in alfalfa varied according to the color of the seeds. As the seeds approached the true color of bright yellow the more impermeable seeds were found. Green seed had more impermeable seeds than did brown seed.

Alternate freezing and thawing was only slightly effective in reducing the number of impermeable dodder seeds. An average of only 8 per cent germinated after 20 freezings, and of this number one-half germinated before freezing. The alfalfa seed proved to be almost 100 per cent viable when tested after treatment with sulfuric acid or scarified. The dodder seed was found at least 70 per cent viable with the sulfuric acid treatment.

The species of the genus Xanthium (cocklebur) [trans. title], F. J. Widder (*Repert. Spec. Nov. R. Veg. Beih. 20 (1923), pp. [3]+222, pls. 8*).—The genus Xanthium is described and the developmental history of Xanthium species outlined. The characteristics of species of Xanthium are detailed, with a determinative key. Hybrids are described, and uncertain species are listed. The contribution also includes an extensive bibliography and outline maps showing the world distribution of important Xanthium species.

Review of the species and hybrids of Xanthium observed in Europe [trans. title], F. J. Widder (*Repert. Spec. Nov. R. Veg., 21 (1925), pp. 273–305*).—The characteristics and distribution of species and hybrids of Xanthium observed in Europe are described, with a determinative key.

Weed occurrence and soil tests in determining lime deficiency in mineral soils [trans. title], N. C. Nielsen (*Nord. Jordbrugsforsk., 1926, No. 4–7, pp. 421–433*).—This article points out how the occurrence of weeds may supple-

ment laboratory methods in determining lime-poor soils. For this purpose a list is given of 42 weeds usually growing on acid soils and a similar list of the species generally growing on alkaline soils. The pH of a series of soils was determined, and the coefficient of occurrence for about 40 of the more common weeds was worked out for the different pH ranges in the soils.

Chlorates as plant poisons [for Canada thistle], A. ÅSLANDER (*Jour. Amer. Soc. Agron., 18 (1926), No. 12, pp. 1101, 1102*).—In an experiment at Cornell University, sodium chlorate (10 per cent), potassium chlorate (6.5 per cent), and sodium arsenite (2 per cent) solutions were sprayed at rates equivalent to from 107 to 321 gal. per acre in November after frost had killed the tops of vegetation on permanent grass plats among the weeds of which *Cirsium arvense* dominated.

Observations during the next spring showed that the heaviest fall applications of sodium chlorate completely eradicated thistles, and that a rather small quantity sufficed to diminish their number and vitality decidedly. Potassium chlorate was similar in its effects, while sodium arsenite was far less effective. Grasses and several other plants suffered little or no injury. The annual weed growth on the plats indicated that the poisonous action was of short duration.

HORTICULTURE

[Horticultural investigations at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 67–74, 111, 112, 114, fig. 1*).—Observations upon the flowers of the Stayman Winesap apple showed that a considerable percentage of the lateral flowers in the cluster are unable to set fruit even under favorable pollinating conditions. This condition was more pronounced than in Baldwin, Jonathan, and Grimes. Pollination studies at Wooster and Chardon indicated that Delicious, Ensee, Golden Delicious, Grimes, Jonathan, McIntosh, Northern Spy, Rome, Wealthy, Baldwin, Nero, Ohio Nonpareil, Rhode Island, and Stayman Winesap are not sufficiently self fruitful to yield commercial crops. The first nine and Oldenburg, San Jacinto, and Yellow Transparent were effective pollinizers for all varieties other than themselves. The last five and Banks were ineffective upon all varieties used. Gallia Beauty proved to be a poor pollinizer for Rome but was very effective upon Stayman Winesap.

Certain growth features sufficiently characteristic to distinguish varieties of peaches in the nursery row are pointed out.

For strawberries grown in rotation with soy beans and potatoes a combination of 8 tons of manure and 320 lbs. of acid phosphate per acre gave excellent results. Nitrate of soda or ammonium sulfate applied before the plants were set did not appreciably increase yields. Fractional applications of nitrogenous materials gave better results than one application in the spring. Muriate of potash and lime were not beneficial. In fertilizer tests at Marietta nitrogen proved the most valuable element for hastening maturity in cabbage. Nitrate of soda was more effective than ammonium sulfate. Nitrate of soda applied one-half before the plants were set and one-half three weeks after setting was less effective than when used in one application prior to planting. Phosphorus was ineffective when used without nitrogen. Potash proved of no value in hastening maturity, and the slight benefit of ground limestone applied alone was masked in the presence of mixed fertilizers. Manure alone had some value, but when used in connection with quickly available nitrogen gave but little benefit in spite of its high nitrogen content.

On a muck soil at Ravenna the application of lime greatly increased celery yields. Both potash and phosphorus increased yields when used as supplements to 1,000 lbs. of 2–8–15 fertilizer. Top-dressings of nitrate of soda and supple-

mental applications of mixed fertilizer also increased yields, indicating that celery is a gross feeder. Applications of chemicals closely approximating those carried in 8 tons of manure were more effective than the manure. Packing house salt proved neither beneficial nor harmful to celery.

Cultural experiments in an apple orchard at the Clermont County Farm showed sod mulch to be quite as effective as tillage with cover crops. At the Hamilton County Farm tilled trees, based on 4 years' data, outyielded the mulched trees by only 9.1 lbs. per tree per year. Nitrate of soda and ammonium sulfate invariably increased apple yields on poorer upland soils of central and southern Ohio whether tilled or mulched. At the Clermont County Farm nitrate of soda and ammonium sulfate used at the rate, respectively, of 160 and 128 lbs. per acre greatly increased apple yields on both tilled and mulched areas. At the Hamilton County Farm on a much more fertile soil nitrogen proved of slight benefit in the tilled area but increased yields in the grass section by over 50 per cent. At the Northeastern Test Farm the yield of Baldwin trees was greatly increased by fertilization with nitrate of soda and acid phosphate. Notes are given upon the results of a variety test of apples at the Southeastern Test Farm. Cost of production studies in a 14-year-old apple orchard on the Clermont County Farm showed a slightly greater net profit from cultivation than from sod mulch.

[Horticultural investigations at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 18, 19, 20, 66, 68, 69, 78, 79–82, 83, 84*).—Preliminary results in fig fertilizer studies at Beaumont and Angleton showed the value of phosphorus. In every instance where used alone or in combination the yields were increased. On the other hand, the use of potash proved of no advantage and nitrogen of little value. The maximum yield was obtained on complete fertilizer plats, and the second largest yield was procured from trees fertilized with lime alone. Studies of the effect of fertilizers on the carrying quality of tomatoes showed potash to have no effect either on carrying quality or upon time of ripening. Fertilizer studies at Troup showed the value of cottonseed meal and acid phosphate for strawberries. For peaches, barnyard manure was the only material to show benefit.

Among promising plants tested are the Chinese elm, Athel, jujube, Methley plum, and Crosby and Quetter nectarines. Of figs tested at Beaumont, the Brunswick was the heaviest yielder, followed closely by Magnolia. The latter proved a better shipping and preserving variety. Satsuma oranges and Meyer lemons were found promising.

At the Weslaco Substation in the Rio Grande Valley the use of cover crops and sod in a Marsh grapefruit orchard adversely affected quality and quantity, due apparently to the reduction of available moisture. Winter crops of alfalfa and Canadian peas, on the other hand, were more satisfactory. In variety tests the New York lettuce, Broad Leaved Flanders and Mammoth Viroflay spinaches, Purple Topped White Globe turnip, Chantenay carrot, Egyptian beet, Golden Acre cabbage, Chinese Giant pepper, and Klondike and Progressive strawberries were among the most promising kinds. The use of nitrates increased the vigor and disease resistance of muskmelon vines. Spraying with copper materials materially delayed ripening. The results of miscellaneous tests with dates, forms of citrus, etc., are briefly discussed.

A small garden guide (*Petit Guide du Jardin. Paris: Vilmorin-Andrieux & Co., 1925, pp. 91, figs. 135*).—This little handbook, with subject matter arranged alphabetically, presents concise notes on the culture of garden vegetables.

The little kitchen garden, D. Giles (*Boston: Little, Brown & Co., 1926, pp. VIII+98, pls. 8*).—A small handbook for the amateur.

The sugar content of asparagus [trans. title], KOCHS (*Landw. Jahrb., 64 (1926), Ergänzungsb. 2, pp. 80, 81*).—The analysis of asparagus shoots gathered from several plats comprising a fertilizer test showed a water content varying between 92.86 and 93.79 per cent, acids between 0.072 and 0.089 per cent, and sugars after immersion between 2.6 and 2.96 per cent.

The effect of pruning on the growth of the tomato, J. WALKER (*Sci. Agr., 7 (1927), No. 6, pp. 193–206, figs. 8*).—A study at the experimental farm, Indian Head, Sask., of the effects upon yield and time of ripening of checking the longitudinal development of staked tomato plants showed a distinct benefit from this treatment, especially in those plants in which the growth was removed just above the second flower truss. In the case of three-truss and unpruned plants, there was almost a complete absence of ripe fruit on the third and subsequent trusses. In the Alacrity tomato, a variety with sparse foliage, there was evidence that flower differentiation and fruit development on the first truss reduced flower differentiation and fruit development in the later formed trusses. No such influence was noted in the Bonny Best, a fact believed explicable by the much greater leaf area in this variety and the consequent ability to manufacture foods. The first ripe fruits were harvested from one-truss plants, but in both varieties the two-truss plants produced the greatest amount of ripe fruits.

Gentes Herbarum, 1920–1925, L. H. BAILEY (*Ithaca, N. Y., 1920–1925, vol. 1, Nos. 1–5, pp. [2]+306, figs. 139*).—This contribution, devoted principally to the botany of cultivated forms, is presented as five separate fascicles containing the following papers: (1) A Collection of Plants in China (pp. 1–49), (2) The Cultivated Brassicas (pp. 53–108) and Two Species of Hibiscus from China (p. 109, 110), (3) Various Cultigens, and Transfers in Nomenclature (pp. 111–136), (4) Certain Cultivated Rubi (pp. 137–200), and (5) Rubus: Enumeration of the Eubati (Dewberries and Blackberries) Native in North America (pp. 201–306).

Carbon dioxide investigations [trans. title], F. MUTH and G. VOIGT (*Landw. Jahrb., 64 (1926), Ergänzungsb. 2, pp. 120–124*).—Experimental applications of carbon dioxide to plants growing in boxes in the open air strongly stimulated the growth of Savoy cabbage, slightly increased that of lettuce, increased the leaf and reduced the root weight of beets, and had no effect upon tomatoes after the plants had grown above the sides of the box. In greenhouse studies the leaf development of begonia, coleus, tradescantia, cobaea, radish, bean, and cucumber was increased by carbon dioxide. There was a 29 per cent increase in the weight of cucumber fruits. Fuchsias and pelargoniums were not affected by carbon dioxide, and no significant effect was noted in gloxinia, rex begonia, Pteris, Nephrolepis, and *Primula obconica*. Poinsettias developed 14 days earlier than cinerarias, were sturdier, darker green, and remained marketable for a longer time following gas treatment. The yield of strawberry plants was increased about 47 per cent. Carbon dioxide was derived in three ways, namely, from commercial cylinders, from the burning of prepared charcoal, and from manure-saturated turf.

Methods of propagation, L. B. STEWART (*Jour. Roy. Hort. Soc., 52 (1927), No. 1, pp. 33–39, pls. 7*).—Brief comments are given upon the results of studies at the Royal Botanic Garden, Edinburgh, upon the propagation by cuttings of a large number of trees, shrubs, and smaller plants. In some plants, notably clematis, cuttings made at the internode rooted more rapidly than did those cut at the node. The author apparently had little difficulty in rooting apple and other backward cuttings. In certain lilies which do not naturally form

bulbils it was found that placing a portion of the flowering stem in a horizontal position in a moist case would induce ready formation of bulbils.

Vegetative reproduction in fruit trees and shrubs [trans. title], [G.] HÖSTERMANN (*Landw. Jahrb., 64 (1926), Ergänzungsb. 2, pp. 50–53, figs. 2*).—Sturdy new shoots of young plants of *Caragana arborescens* and *Laburnum vulgare* cut back severely the preceding season were ringed in August, following which the plants were set so deeply that the rings were covered with about 10 cm. (4 in.) of soil. By November both species had developed extensive roots from the callus above the wounds.

Physiological investigations in fruit growing [trans. title], R. EWERT (*Landw. Jahrb., 64 (1926), No. 5, pp. 759–786, figs. 6*).—A review, with comprehensive bibliography, of English and American investigations in fruit breeding, fruit stocks, and sterility relations.

The composition of the fruits of Moravia [trans. title], K. NEOBAL and J. BLAHA (*[Czechoslovakia] Min. Zemědĕl., Zpr. Výzkumn. Úst. Zemědĕl. No. 18 (1926), pp. 26+[40]; Fr. abs., pp. 22–26*).—Herein are presented, largely in tabular form, the results of a study at the Institute of Agronomic Research, Brno, of the chemical composition of fruits grown in Moravia, including such items as dry matter, insoluble substances, sugars, acids, mineral content, etc.

The preservation of fruits by protective coatings [trans. title], KOCHS (*Landw. Jahrb., 64 (1926), Ergänzungsb. 2, pp. 75, 76*).—Of several materials, including Para rubber dissolved in benzol; collodion; gum arabic; gum arabic and glycerin; gum arabic, glycerin, and copper sulfate; beeswax; odorless polishing wax; colloidal silicic acid; and starch paste with soda, used as external coverings for apples and pears, the polishing wax applied with a rag was the most successful treatment, the fruits of both species keeping much longer when thus treated than the controls.

Physiology: Programme of research with brief progress reports, R. C. KNIGHT (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), I, Gen., pp. 55–57*).—In studying the flow of water through the union formed in budding or grafting the apple, it was found that wood elements in existence at the time of grafting soon become blocked in the immediate region of the union, resulting in a low conductivity. In the plum, on the other hand, evidence was secured that the pregraft wood becomes blocked over a considerable distance from the union. The same condition was observed below pruning wounds. A check of the carbohydrate changes accompanying the seasonal cycle of growth and water content in the stem showed a decrease in carbohydrates in the early part of the growing season. Further evidence (E. S. R., 56, p. 43) was obtained to show that a large amount of water in the soil favors callus formation, whether the soil be clay or sand. Cuttings in soil top-dressed with lime rooted 34 per cent as compared with 8 per cent for those in soil treated with ammonium sulfate. Quicker rooting was obtained in every case when the basal cut was made midway between rather than just below a node. Some lots of etiolated plum cuttings showed high rooting capacity.

Pruning investigations showed a close quantitative correlation between root and top growth. Severe pruning had a tendency to increase the number of new stems and to decrease the thickening of existing stems. It was observed that at the time buds are developing the neighboring region of the stem often shows several rows of new tracheae, as compared with none in the wood elements in the vicinity of dormant buds.

Apple root-stocks, their particular suitabilities for different soils, varieties, and purposes, R. G. HATTON (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), I, Gen., pp. 46–52*).—Lane Prince Albert worked upon dwarf,

semidwarf, vigorous, and very vigorous stocks developed by the East Malling Research Station, England, grew 132, 203, 242, and 275 cm. in height, respectively, in the first seven years, and yielded to the seventh year a total of 112, 65, 65, and 10 fruits, respectively, differences which, when submitted to statistical analyses, proved significant. Similar responses were obtained on five different soils. The results show quite definitely the superior cropping value of trees on dwarf stocks during the early years of the orchard, but it is believed extremely likely that some of the more vigorous stocks will later prove to be more valuable.

Apple pruning: Summary of deductions, N. H. Grubb (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), I, Gen., pp. 41–45*).—The total yields computed in bushels per acre for three varieties, namely, Lane Prince Albert, Early Victoria, and Grenadier, up to their ninth year were 82, 173, and 70 bu. for tipped trees and 242, 522, and 209 bu. for untipped trees, thus showing that cutting back of the leading shoots had a deleterious effect upon yields. That variety also plays an important part in pruning was shown in studies with Worcester Pearmain and Newton Wonder, where tipping greatly reduced the yields of Worcester Pearmain, which bears most of its fruit on the tips of shoots from 6 to 18 in. long, but had no inhibiting effect upon Newton Wonder, a free-spurring variety. It is pointed out that upright-growing trees should be cut to outward buds, while spreading kinds should be cut to upward- or inward-growing buds.

Two bad variety mixtures, J. K. Shaw (*Natl. Nurseryman, 35 (1927), No. 2, p. 46*).—A brief discussion of two obscure apple varieties which are frequently found mixed with nursery stocks of Gravenstein and Baldwin, respectively.

Cool storage investigations, season 1925, N. McClelland and L. W. Tiller (*Cawthron Inst., Nelson, N. Z., Chem. Dept. Bul. 1, n. ser. (1926), pp. 16, pls. 3*).—A brief report upon apple storage investigations conducted by the Cawthron Institute, New Zealand. Considerably more flesh collapse occurred in fruits stored at 32–34° F., with a humidity of 50 per cent, than in those held at higher temperatures and higher humidities. Since collapse was even more prevalent in a lot stored at 32–34° with high humidity, the author believes that temperature is the chief causal agent. This flesh collapse is considered identical with internal breakdown of other countries, and may be practically eliminated by storage at 46°. The location of the orchard in which the fruit was grown affected its keeping. Varietal differences also played a rôle, Delicious, for example, storing better at low temperatures and high humidity than many other varieties. Although it is not conceded practical to maintain the temperature high enough to avoid this internal injury, it is believed that a temperature of 38–40° combined with a reasonably low humidity will hold the loss at a minimum.

Temperature conditions in refrigerated holds carrying apples, A. J. M. Smith (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd., Spec. Rpt. 27 (1926), pp. VI+52, figs. 31*).—Readings taken in the refrigerated holds of ships employed in transporting fruit from Australia to England showed great variability in the temperature in the different parts of the hold, especially during the time when the fruit was being cooled. The differences between the warmest and the coolest locations frequently amounted to 15° F. and were rarely less than 10°. Forced air circulation failed to aid greatly in equalizing the temperature and was of no benefit in hastening cooling. The author believes that fruit should be cooled prior to loading on the ship. In holds employing forced horizontal draft there was found a tendency for the air stream to descend, benefiting the lower portion of the cargo and missing the

upper central portion. To remedy this, the author suggests the desirability of applying refrigeration at the top of the hold.

Pollination studies at Alnarp, 1923–1925 [trans. title], E. Johansson (*Meddel. Perm. Kom. Fruktodlingsförsök [Sweden], No. 7 (1926), pp. 30; Eng. abs., pp. 25–29*).—Observations at Alnarp, Sweden, showed all sweet cherries studied to be self-sterile and the Ostheim sour variety to be practically so. Intersterility was noted in the Annonay×Early May Heart, and the Black Tartarian×Rivers Early combinations. The lowest pollen germination in 20 odd cherries tested in 1925 was found in Impératrice Eugénie (9 per cent) and the highest (90 per cent) in Annonay. In 14 plums, 9 varieties, including such well-known sorts as Green Gage, Jefferson, Reine Claude Althann, and Drap d'Or d'Esperen, were self-sterile. One variety was partially self-fertile and four, namely, Czar, Orlean, Oullins Golden Gage, and Queen Victoria, were self-fertile. The results of similar studies upon pears and apples are noted, and parental combinations which have proved successful are given for all four species of fruits. Cross incompatibility was found in the case of Ribston Pippin and Cox Pomona, two closely related varieties.

The commercial culture of table grapes.—I, The better varieties, H. Latière (*La Culture Commerciale des Raisins de Table.—I. Les Meilleures Variétés. Paris: Libr. Spéciale Agricole, 1926, pp. 67, figs. 21*).—Various important varieties of vinifera grapes are described in detail.

Selection in the grape [trans. title], Biermann (*Landw. Jahrb., 64 (1926), Ergänzungsb. 2, pp. 143–145*).—Observations extending over a 7-year period upon the individual vines in a commercial vineyard showed only 14 per cent to bear every year and 5 per cent which never fruited at all. Records taken in 1925 in a vineyard showed 6⅔ per cent of the vines bearing clusters which averaged 33.2 oz., 46⅔ per cent with clusters averaging 18.5 oz., and 6⅔ per cent with clusters averaging only 5.8 oz. At the same time the acidity of the juice of the fruits of individual vines ranged from 7.5 to 10.9 per cent. From this variability the author concludes that greater care should be exercised in the choice of parent vines for new vineyards.

Xenia in grapes [trans. title], F. Muth and G. Voigt (*Landw. Jahrb., 64 (1926), Ergänzungsb. 2, pp. 131, 132*).—Records taken at Geisenheim upon the results of controlled reciprocal crosses between several varieties of grapes of contrasting color failed to show in any instance any immediate effect of the pollen parent upon the color or shape of the resulting berries.

Some physical and chemical changes occurring during the ripening of grapes, II, P. R. v. d. R. Copeman and G. Frater (*Union So. Africa Dept. Agr., Sci. Bul. 50 (1926), pp. 54, figs. 30*).—Further work (E. S. R., 52, p. 641) upon physical and chemical standards for determining the maturity of vinifera grapes confirms and enlarges the principal conclusions reached in the earlier bulletin. At maturity the volume of juice in a given weight of berries attains a maximum between 70 and 75 per cent, according to the variety. The sugar content attained a maximum at maturity and thereafter remained practically constant. The Balling degree of juice at maturity was between 16 and 18°, according to the variety. Acid decreased to a minimum value during ripening. Changes in nitrogen content could not be correlated with ripening changes. It is pointed out that the physical aspect or appearance of the grapes should be given due consideration. The berry should be large and translucent, but still firm.

Fresh grape export investigations, F. de Castella (*Jour. Dept. Agr. Victoria, 25 (1927), No. 1, pp. 15–30, figs. 2*).—Ohanez grapes shipped in April, 1926, from Victoria, Australia, to London, England, in refrigerated compartments

held at about 33° F. reached their destination in excellent condition, irrespective of the method of packing or previous treatment. Trial shipments of Gordo Blanco, Rosaki, and Ohanez grapes from Australia to New Zealand were successful only in the case of the Ohanez variety packed in cork sawdust. Cold-storage tests with Gianetti, Emperor, Purple Cornichon, and Ohanez grapes, part dusted with sulfur, part fumigated with sulfur dioxide, and part untreated, failed to show any beneficial effect from these supplementary treatments; in fact the sulfur dioxide lots had an unattractive appearance and an inferior flavor. All varieties excepting Gianetti proved to be good keepers.

Hold-over effects of fertilizers in an orange grove, G. Surr (*Calif. Citrogr., 12 (1927), No. 4, pp. 117, 138*).—Records taken upon the 1922–23 crop in a navel orange orchard which had been utilized in a fertilizer test during the period 1915–1919, previously reported upon by Vaile (E. S. R., 48, p. 446), showed important hold-over effects of the various treatments. The average yield of the original 11 unfertilized plats was 26 lbs. of fruit per tree, while the average yield for the 6 manured plats was 75 lbs. A plat which received nitrate of soda during the five experimental years at the rate of 10 lbs. per tree yielded 154 lbs. of fruit per tree. The maximum yield, 156 lbs., was produced on trees in a plat which received extra heavy applications of dried blood. A study of the data showed that the average yield of plats which were treated with commercial fertilizer was decidedly greater than the average of the manured plats.

The orange in medicine, H. Ségalen (*L'Oranger et ses Fruits en Thérapeutique. Thesis, Facult. Méd. et Pharm. Univ. Bordeaux, 1925, pp. 55, fig. 1*).—A general discussion of the various therapeutic uses to which the fruits, flowers, and leaves of the orange have been applied.

A comparative study of the citrus industry of South Africa, H. J. Webber (*Union So. Africa Dept. Agr. Bul. 6 (1925), pp. 106, figs. 18*).—A general treatise upon the citrus industry of South Africa based upon information obtained in an extended survey. Interspersed is a great deal of information concerning the various phases of culture, selection of rootstocks, propagation, bud variation, control of insect and fungus pests, etc.

Preliminary paper on the ripening of oilpalm-fruits, H. N. Blommendaal (*Commun. Gen. Expt. Sta. Alg. Ver. Rubberplanters Oostkust Sumatra, Gen. Ser. No. 20 (1925), pp. 43, figs. 7*).—Herein are reported the results of a study of the changes occurring in oil palm fruits during the ripening period. It was found that the maximum oil content is reached about the time the outer fruits loosen naturally in the cluster. After reaching full maturity the free fatty acid content begins to increase, but after 3 days the increase amounted to only 0.6 per cent. In the vicinity of Medan the duration of the favorable harvest period lasted only about 5 days. The formation of oil occurs in the relatively short period of 24 days.

The cultivation of papaya and the preparation of papain, F. A. Stockdale (*Trop. Agr. [Ceylon], 68 (1927), No. 1, pp. 3–8, pl. 1, fig. 1*).—General information is offered upon the culture, botany of the flower, and methods of gathering and preserving the latex, etc.

Ginger: Its cultivation, preparation, and trade (*Bul. Imp. Inst. [London], 24 (1926), No. 4, pp. 667–682, pl. 1*).—A general article treating of the habits of growth, cultural requirements, methods of harvesting, yields, control of pests, and utilization.

Growing daffodils from seed, D. Griffiths (*Natl. Hort. Mag., 6 (1927), No. 1, pp. 18–20, fig. 1*).—This comprises general information on cultural requirements.

Commercial rose culture, E. HOLMES (*New York: A. T. De La Mare Co., 1926, 3. ed., pp. 223, pl. 1, figs. 75*).—A revised edition of a previously noted work (E. S. R., 42, p. 239).

Violet culture for pleasure and profit, F. E. DILLISTONE (*London: Ernest Benn, 1926, pp. 32*).—A small handbook of general cultural information.

Winter blossoms from the outdoor garden, A. W. DARNELL (*London: L. Reeve & Co., 1926, pp. XXIV+335, pls. 24, figs. 6*).—A descriptive list of exotic trees, shrubs, and herbaceous plants that flower in the outdoor garden in the British Isles during the months of December, January, and February.

Familiar flowers of field and garden, F. S. MATHEWS (*New York and London: D. Appleton & Co., 1925, rev. ed., pp. XV+310, pls. 13, figs. 199*).—A revised edition, arranged chronologically according to the time of flowering, and containing brief popular notes on the appearance, habits of growth and blossoming, geographical distribution, etc., of many of our native and introduced plants.

The flower garden day by day, MRS. F. KING (*New York: Frederick A. Stokes Co., 1927, pp. IX+210*).—A handbook containing chronologically arranged suggestions for the care of the flower garden.

The art and craft of garden making, T. A. and E. P. MAWSON (*London: B. T. Batsford; New York: Chas. Scribner's Sons, 1926, 5. ed., pp. XII+440, figs. 517*).—An elaborately prepared discussion upon English gardens and garden practices.

A history of the art of gardening, I, II, M. L. GOTHEIN (*Geschichte der Gartenkunst. Jena: Eugen Diederichs, 1926, vols. 1, pp. VII+451, figs. 311; 2, pp. 505, figs. 326*).—A popular treatise.

Modern gardens, British and foreign, P. S. CANE (*Studio [London], 1926–27, Spec. Winter No., pp. VIII+166, figs. 194*).—Through the aid of illustrations, part in color, a picture is given of the principal features of important English and foreign gardens.

Garden books, old and new, compiled by M. EVANS (*[Philadelphia]: Penn. Hort. Soc., 1926, pp. 86*).—A selected and classified list, with annotations concerning contents and value.

Plant materials of decorative gardening: The woody plants, W. TRELEASE (*Urbana, Ill.: Author, 1926, 3. ed., rev., pp. XLIII+188*).—A third and revised edition of a previously noted handbook (E. S. R., 47, p. 643).

Manual of cultivated trees and shrubs, A. REHDER (*New York: Macmillan Co., 1927, pp. XXXVII+930, fig. 1*.—A systematic and descriptive enumeration of the cultivated trees and shrubs hardy in North America, exclusive of the subtropical and warm temperate regions. The text is supplemented with analytical keys to assist in the identification.

Plants of Glacier National Park, P. C. STANDLEY (*Washington: U. S. Dept. Int., Natl. Park Serv., 1926, pp. IV+110, pls. 5, figs. 150*).—Profusely illustrated, part in color, this handbook contains brief nontechnical descriptions of the more conspicuous native plants.

FORESTRY

A year in the wonderland of trees, H. HAWKSWORTH (F. B. ATKINSON) (*New York: Charles Scribner's Sons, 1926, pp. X+214, figs. 64*).—Popular information is presented upon trees and forestry practices with a viewpoint of interesting school children in forest conservation.

Trees and shrubs of the Rocky Mountain region, with keys and descriptions for their identification, B. O. LONGYEAR (*New York and London: G. P.

Putnam's Sons, 1927, pp. XVII+244, pls. 9, figs. 128).—A handbook designed to aid in the identification.

Conifers, junipers, and yew: Gymnosperms of British Columbia, J. DAVIDSON (*London: T. Fisher Unwin, 1927, pp. XVII+72, pls. 38*).—Illustrated in part in color, this book contains descriptive information and notes on the distribution of the important conifers of British Columbia.

Cultural studies with Scotch pines from various sources [trans. title], GROSS (*Mitt. Sächs. Forstl. Versuchsanst. Tharandt, 2 (1925), No. 5, pp. 185–197*).—A report upon the behavior of young Scotch pine trees raised from seed of the same lots used in the Chorin experiment (E. S. R., 48, p. 140).

Records taken upon the trees showed those of Belgian origin to have made the greatest growth, those from East Prussia seed second, and from Scottish seed third. In the case of the Chorin test East Prussia, Brandenburg, and Belgian were the three leaders. Trees raised from French seed were the poorest growers in both tests. In discussing the experiments, the author emphasizes that sweeping deductions should not be drawn from this rather limited test, as there may be without doubt far better strains available in all the original countries.

Influence of lopping Norway spruce upon the soil and tree growth [trans. title], K. MATTL (*Centbl. Gesam. Forstw., 53 (1927), No. 3–4, pp. 92–106, figs. 2*).—A study of stands located near Greifenburg, Austria, showed lopping to have a disastrous effect upon the trees and the underlying soil. The lopped trees were covered with lichens and moss and were generally unthrifty. The soil supported a dense growth of ground species which interfered with natural regeneration of the spruce. The usual soil covering of needles was absent, and as a result the soil was dry in midsummer when that of the normal forest was moist. This fact materially increased the fire hazard. Records of trunk growth showed that it had taken lopped trees over twice as long to make a growth equal to that of normal trees. Height was also reduced by lopping. Replantings beneath the canopy of lopped spruce made rapid growth and were soon able to replace the weakened trees with a thrifty forest.

East African pencil cedar, H. M. GARDNER (*Empire Forestry Jour. [London], 5 (1926), No. 1, pp. 39–53, pl. 1, fig. 1*).—Pointing out that the pencil cedar, *Juniperus procera*, is the largest known species and that the wood is almost identical in appearance and quality with that of the American junipers and should therefore be an excellent substitute in the manufacture of pencils, the author discusses the distribution and the composition of the forests in which cedar occurs, habits of regeneration, and the possibility of artificial plantings.

The occurrence of laticiferous vessels in the mature bark of Hevea brasiliensis, E. QUISUMBINO (*Calif. Univ. Pubs. Bot., 13 (1927), No. 15, pp. 319–332, pls. 4*).—A study of the structure of the bark of young Hevea trees planted in the field in 1911 showed laticiferous vessels to be abundant in the inner bast, and to occur less freely in the outer bast and the region outside the stone ring. Tanniferous vessels also occurred in the outer bark but were distinguished by their position, shape, and structure. Latex tubes may have two origins, from the cambium in the secondary cortex and also from the primary cortex and phellogen outside the stone ring.

Regeneration and tending of the teak [trans. title], H. M. J. HART and A. C. NOLTEE (*Tectona (Boschbouwk. Tijdschr.), 22 (1927), No. 2, pp. 199–213; Eng. abs., pp. 212, 213*).—A study of teak plantations showed that with the exception of very good soils renewal plantings must be intercropped with legumes. On the better-quality locations natural vegetation may serve for this purpose. A method of close planting followed by early thinning is deemed best for a proper formation of trunk and branches.

Forestry [at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 118–142, figs. 9*).—Data are presented upon the location and size of the State forests and the State forest parks and upon activities in planting, tree growing, and the suppression of forest fires. The fires are analyzed in respect to their cause, number, resulting losses, and comments are given upon the organization of the forest fire fighting forces.

DISEASES OF PLANTS

Botany and plant pathology (*Ohio Sta. Bul. 402 (1927), pp. 35–45, 45–48, figs. 4*).—From a study of the correlations of temperature and rainfall with ascospore discharge, spray programs were adopted in 1926 that are said to have proved very profitable to fruit growers.

In extensive spraying and dusting experiments for the control of brown rot and peach scab negative results were obtained due to the unfavorable season for the fungus. Sodium silica fluoride with and without sulfur did not control *Bacterium pruni* on the peach.

Experiments for the control of damping-off of coniferous seedlings showed that the most satisfactory results were obtained with formaldehyde. Organic mercury compounds as used did not control the disease at all satisfactorily.

Spraying and dusting experiments with potatoes showed increased yields for Bordeaux mixture and fresh mixed copper-lime dust. Copper-stearate dust was less satisfactory. Fresh mixed copper-lime dust is said to have proved superior during the past two seasons to commercial mixed dust or liquid Bordeaux mixture for the control of potato hopperburn. It was also prepared at a cost of about one-half the commercial mixture.

As a result of a study of degenerative diseases of potatoes it was found that rugose mosaic spread in the field so that 1 plant in every 12 became infected in the seventh row from the infected plantings.

Inoculation experiments with a mixture of tomato and tobacco mosaic produced streak in a large number of tomato plants. Inoculating with a mixture of juice from mosaic tomato leaves and leaves of apparently healthy potato plants also produced the disease.

A comparison of methods of soil sterilization in greenhouses showed that friability of soil and soil moisture were important factors in the heat penetration of soil, a moisture content of less than 28 per cent giving better results than where a greater percentage of moisture was present. The harrow method was found much inferior to the pan method on heavy, wet clay. Chemical treatments of soil for nematode control were compared with steam sterilization, and only the steam sterilization was successful.

A strain of early cabbage selected as resistant to yellows is said to have proved quite resistant when compared with commercial strains of the same variety.

Experiments on the control of early and late blight of celery showed effective control by Bordeaux mixture, but copper-stearate dust did not give good control. Commercial and home-mixed copper-lime dusts also gave satisfactory control.

Tests conducted in 1926 to reduce the cost of treating oats for smut control are said to have given promising results, but further trials are believed necessary before definite recommendations can be made.

In experiments for the control of stinking smut of wheat, seed from the same lot was treated at the station at Wooster and at Columbus, and portions of each treated lot were exchanged and planted at each place. The results of

the treatments are shown in tabular form, from which it appears that there was a considerable lack of uniformity of control in the treatments.

Studies are reported on the availability of the quinhydrone electrode for use in connection with studies of the nature of the resistance of certain tomatoes to Fusarium wilt. The preliminary experiments indicate that the quinhydrone and the hydrogen electrodes will give nearly the same pH values on comparable samples of some plant juices but not on others. The work is said to indicate that the H-ion concentration of resistant and susceptible varieties is about the same, and that this factor is probably not the cause of resistance. Tests of diseased and healthy plants indicated that plants infected by *F. lycopersici* were more alkaline than healthy plants. It is believed that the fungus is able to alter the normal H-ion concentration of the juice and that the change is toward greater alkalinity.

Report of the Dominion botanist for the year 1925, H. T. GÜSSOW ET AL. (*Canada Expt. Farms, Div. Bot. Rpt. 1925, pp. 116, figs. 16*).—This extensive report of the division comprises contributions from the Central Laboratory at Ottawa as well as from the individual branch laboratories throughout Canada. In general character it follows those previously noted (E. S. R., 52, p. 845; 54, p. 744).

Plant pathology in Canada, B. T. DICKSON (*Sci. Agr., 5 (1925), No. 7, pp. 211–217, figs. 2*).—In the presidential address at the annual meeting of the Canadian Society of Phytopathology in December, 1924, the speaker outlined the scope, history, needs, and prospects of plant pathology in Canada, covering a period of about 75 years.

[Plant pests and diseases], W. G. FREEMAN (*Trinidad and Tobago Dept. Agr. Rpt. 1925, pp. 31–33*).—This portion of the director's report summarizes information regarding coconut bud rot, red ring disease and nematode, sugar cane mosaic and froghopper blight, lime blossom blight and withertip, a coffee disease ascribed to *Sclerotium coffeicolum,* and an attack by the coconut nematode on both oil and date palm.

Annual report [on plant diseases], 1925–26, R. H. BUNTING and H. A. DADE (*Gold Coast Agr. Dept. Rpt. 1925–26, pp. 32–36*).—The mycologists submit, separately, accounts of plant-disease conditions noted on their respective tours, with mention of several fungi which are said to be newly recorded for the area covered by the reports.

Annual report of the mycologist for the year 1924, J. McDONALD (*Kenya Colony Dept. Agr. Ann. Rpt. 1924, pp. 106–111*).—Coffee-berry disease, apparently caused by *Colletotrichum coffeanum,* is thought to be controllable by the use of a spraying program which has been worked out. A splitting of coconut husks with exudation of gum appears to be nonparasitic, probably caused by unfavorable soil conditions combined with dry weather. A maize cob pink mold is fairly general throughout the country. A Fusarium isolated is thought to be a stage in the life history of *Gibberella saubinetii.* A dying out of apple trees appears to be due primarily to the lowering of resistance by white-ant attack on the roots, followed by development of *Botryodiplodia theobromae,* ordinarily a weak parasite only. A coffee seedling damping-off and a root disease of strawberries are ascribed to the same fungus, tentatively identified as *Rhizoctonia solani.*

Of two local quicklime samples tested for use in sprays, one was found to be satisfactory and probably available for use in making up spray for coffee-berry disease. A coffee-root disease proved to be due to *R. lamellifera.* Broomcorn (*Andropogon sorghum*) was found to be infected with smut (*Sphacelotheca sorghi*). A bean disease is supposedly caused by *Vermicularia capsici.*

Attempts to inoculate kafir with *Cerebella sorghi-vulgaris* indicated that the *fungus* was not parasitic but lived on a sugary liquid excreted from the heads.

Annual report of the Government mycologist, W. Small (*Uganda Dept. Agr. Ann. Rpt. 1924, pp. 18-20*).—Diseases of coffee, Hevea, cotton, food crops, and other plants are noted, as are also attacks by nematodes.

Report of the mycologist, W. Small (*Uganda Dept. Agr. Ann. Rpt. 1925, pp. 23, 24*).—This report, covering the period January 1 to September 30, 1925, shows the same general plan and scope as that for the previous year, above noted.

Immunity in plants [trans. title], D. Carbone (*Riv. Biol., 8 (1926), No. 1, pp. 62-73*).—A synthetic review, with bibliography, is given of various views regarding the nature of immunity of plants to disease.

Relation between host and parasite [trans. title], A. Zimmermann (*Centbl. Bakt.* [etc.], *2 Abt., 63 (1924), No. 1-8, pp. 106-124, figs. 2; 65 (1925), No. 14-21, pp. 311-418, figs. 8*).—Of the two parts of this elaborate exposition, the first deals with Erysiphaceae, the second with the Uredineae. Bibliographical references are numerous, particularly for the second part.

Parasitic and wood-destroying fungi of Boone County, Missouri, W. E. Maneval (*Missouri Univ. Studies, 1 (1926), No. 1, pp. 63-111*).—Parasitic and wood-destroying fungi, collected with the exception of about 50 species in Boone County, Mo., are listed to include species to the number of 27 Phycomycetes, 65 Ascomycetes, 23 Ustilaginales, 99 Uredinales, 81 of other Basidiomycetes (mainly wood-destroying), 159 Fungi Imperfecti, 18 of bacteria, and a few miscellaneous organisms, making a total of about 480. It is thought probable that fully 1,000 species of parasitic fungi occur in Missouri.

Study of Fusarium attack on seed [trans. title], A. Bolt (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 6 (1926), No. 1, pp. 2, 3, fig. 1.*)—A method and arrangement of a test plat are described.

Texas root-rot (*Texas Sta. Rpt. 1926, p. 84*).—Investigations of this disease at one of the substations seem to show that plants in sandy soils are less affected by the fungus than those in heavier soils. The fungus has also been found to attack alfalfa, clover, cowpeas, peanuts, mung beans, field beans, and sugar beets. Many shade trees were also found susceptible to the disease, and carrots, beets, okra, sweet pepper, string beans, and black-eyed peas were attacked. Sweet potatoes were also affected at this station.

The Uredinales (rusts) of Iowa, J. C. Arthur (*Iowa Acad. Sci. Proc., 31 (1924), pp. 229-255*).—The author's original list of Iowa rusts given out 40 years previously, said to have contained 134 species as then rated and claimed to have constituted up to this time the only such list published, has by the present contribution been enlarged to include 164 species as now understood. The names of 62 persons appear as collectors of the specimens here recorded.

Tests of dry fungicides [trans. title], E. Riehm (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 6 (1926), No. 3, pp. 17, 18*).—Results are given, in tabular form, of experiments with several fungicides employed for treating wheat seed.

Dry seed treatments [trans. title], J. Krauss (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 5 (1925), No. 11, pp. 87, 88*).—Results are tabulated for seed treatments employing calcium oxide, calcium hydrate, and one or the other of these with paraform.

The significance of temperature in seed treatments [trans. title], W. Lang (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 5 (1925), No. 4, pp. 29, 30*).—Time, concentration, and temperature are dealt with as factors in the treatment of seed grains with copper sulfate, formaldehyde, and Germisan.

Copper against Oidium [trans. title], J. Bernatsky (*Nachrichtenbl. Deut. Pflanzenschutzdienst, 6* (*1926*), *No. 7, p. 52*).—Nosperal is claimed, on the basis of 1925 experimentation, to be effective, not only against *Peronospora cubensis* on melons and cucumbers, but also against Oidium on pumpkin.

Cereal rusts [trans. title], R. González Fragoso (*Bol. Estac. Patol. Veg.* [*Inst. Agr. Alfonso XII, Madrid*], *1* (*1926*), *No. 2, pp. 41–48, figs. 4*).—Descriptive accounts are given of cereal rusts prevalent in Spain, with a brief discussion of preventive measures available, including chiefly seed treatment and seeding of more resistant varieties.

Black rust in Scotland, I. Maxwell and G. B. Wallace (*Brit. Mycol. Soc. Trans., 11* (*1926*), *pt. 1–2, pp. 138–145, pl. 1*).—Black rust in Scotland occurs usually in scattered areas, infection on cereals and grasses being heavy only in the immediate vicinity of affected barberries. Since no evidence is at hand that the disease overwinters by means of uredospores, the destruction of barberries is thought to be a safe means of eradicating the disease. Observations in Scotland show that *Puccinia graminis* is present in the forms *tritici*, *phlei-pratensis*, *secalis*, *avenae*, and *agrostidis*. The last mentioned three forms have locally the same powers of infection as in England and North America.

The life-history of some parasitic species of Helminthosporium, N. J. G. Smith (*Brit. Assoc. Adv. Sci. Rpt., 93* (*1925*), *pp. 364, 365*).—"*H. gramineum*, which causes leaf stripe disease of barley, has hitherto been considered to inhabit the growing point of the host, and thence to infect all the young parts of the plant as they are formed. It is now shown that each leaf is infected from the leaf or sheath which inclosed it in its younger stages, and that if the growing point of the plant is reached the result is the death of the plant. This disease resembles those caused by *H. teres* and *H. avenae* more than it resembles smut diseases, and many of the phases of the three Helminthosporium diseases can be brought into allgnment. *H. sativum* must now be added to these three as a fourth species parasitizing British cereals. Some interesting features of culture work on these organisms and additions to the knowledge of the conidial, pycnidial, and perithecial forms of fructification will be described."

Resistance to covered smut in varieties and hybrids of oats, E. F. Gaines (*Jour. Amer. Soc. Agron., 17* (*1925*), *No. 12, pp. 775–789, fig. 1*).—Of 210 varieties and selections of oats tested for resistance to covered smut (*Ustilago levis*) during the past eight years, 21 were smut free, the others ranging from slight infection to extreme susceptibility. Markton, one of the immune selections, is a thin hulled, white oat of *sativa* type, and is among the best yielding varieties tested. It has been grown commercially since 1924.

The inheritance of the immunity of Red Rustproof has ben studied in four crosses made with susceptible varieties. Apparently Red Rustproof carries three dominant factors for immunity, any one of which prevents the production of covered smut spores. In crosses with Large and Chinese Hulless, one factor apparently does not give complete dominance in hull-less segregates, but otherwise the prepotency of the factors for immunity is similar in all four crosses. Of 56 F_2 plants selected from smut-free rows, 45 produced only smut-free plants in the F_3 generation.

Breeding oats resistant to Puccinia graminis avenae, S. M. Dietz (*Iowa Acad. Sci. Proc., 31* (*1924*), *p. 131*).—A test of about 300 oat varieties showed some of these to be susceptible and some resistant to *P. graminis avenae*. Brief details are given.

The inheritance of resistance to Puccinia graminis in crosses between varieties of durum wheat, J. B. Harrington (*Sci. Agr., 5* (*1925*), *No. 9, pp. 265–288, figs. 5*).—A study of the parasitic capabilities of 4 physiologic forms of

P. graminis tritici on F_3, F_4, and F_5 progeny from crosses involving the *Triticum durum* varieties Kubanka No. 8, Mindum, and Pentad shows the physiologic forms 1, 17, 21, and 34 to be consistent in their reaction on 12 differential varieties of wheat, regarding which details are given.

Reaction to rust proved to be inherited in the same manner as are other characters. Several factors were involved, and environmental influences modified the expression of the rust reaction.

Fairly satisfactory agreement was found between the rust results in the greenhouse for one year and those of the next year. No relation was found between rust reaction and seed color.

A heavy rust epidemic was obtained in the rust nursery by spraying with a mixture of spores of 7 Northwest physiologic forms. An epidemic occurred also in the agronomy nursery owing to the favorableness of the season for rust development. The results for Mindum × Pentad hybrids indicated the presence of more than one genetic-factor difference for each of the characters of rust reaction in the nursery, erectness of plant, height of plant, and earliness of heading. A negative correlation appeared between rust reaction in the nursery and the reaction to form 1 in the greenhouse. A slight linkage was apparent between the inherited factors which govern rust resistance under field conditions, plant height, erectness of plant, and time of heading. The hybrids which resembled Pentad in rust reaction also resembled this form in other characters.

The differential reaction of strains within a variety of wheat to physiologic forms of Puccinia graminis tritici, T. A. Kiesselbach and G. L. Peltier (*Nebraska Sta. Research Bul. 39 (1926), pp. 15, fig. 1*).—The data presented are said to indicate that there may be decided variation in the differential reaction of wheat strains within a commercial variety to various physiologic forms of *P. graminis tritici*. The 578 strains selected from Crimean C. I. 1435 were observed to separate into two groups which are considered to offer decided promise for further testing in the field for comparative performance. One of these groups is said to react like the variety Kanred, while the other small group was moderately resistant to all 10 physiologic rust forms. All the other selections were found more susceptible than Kanred. In a study of a miscellaneous group of varieties and Turkey strains, none were found to be more resistant that Kanred.

Cytological conditions in wheat in relation to the rust problem, W. P. Thompson (*Sci. Agr., 5 (1925), No. 8, pp. 237–239*).—In this paper, read at the Cereal Rust Conference at Winnipeg, Can., on September 9–10, 1924, the author states that the very high correlation existing between rust resistance and durum characters is only one phase of a more general correlation. In reality all the durum characters, including resistance, are correlated, and also all the vulgare characters. The evidence for this is partly summarized in the present account.

Preliminary experiments on the control of leaf and stem rusts of wheat by sulphur dust, D. L. Bailey and F. J. Greaney (*Sci. Agr., 6 (1925), No. 4, pp. 113–117, figs. 4*).—The data here presented, with discussion, permit a fairly accurate estimation of the amount of injury actually caused to wheat interests by stem and leaf rusts. Under certain field conditions the reduction amounted to as much as 76 per cent.

Sulfur dusted on frequently was found to control rust effectively. The cost of the material would not prohibit the extension of this advantage to general farm practice. The actual large-scale cost and the practical difficulties have not, however, been accurately estimated.

The effect of rotation and tillage on foot-rot of wheat in Kansas, 1920–1924, M. C. SEWELL and L. E. MELCHERS (*Jour. Amer. Soc. Agron., 16 (1924), No. 12, pp. 768–771, pls. 2*).—Wheat foot rot was present during 1921–1924 in the tillage and rotation experiments of the Kansas Experiment Station. Wheat in rotation was not damaged by foot rot. September plowing, with or without previous disking, did not favor the development of this disease. Wheat foot rot may occur in fields cropped continuously to wheat even where the best tillage method is practiced. The continuity of long time experiments based on continuous wheat culture may be interrupted by the development of foot rot.

The present status of the barberry eradication campaign in western Canada, V. W. JACKSON, W. P. FRASER, and D. L. BAILEY (*Sci. Agr., 5 (1925), No. 12, pp. 375–378*).—The departments of agriculture in the Dominion of Canada and in the three Provinces, Manitoba, Saskatchewan, and Alberta, are said to have cooperated closely during the eight years preceding this report. The results, however, have only recently for the first time been collected and correlated, and are here briefly and systematically presented.

The reactions of bean rust grown on leaves in solutions, C. W. WATERS (*Mich. Acad. Sci., Arts, and Letters, Papers, 5 (1925), pp. 163–177, figs. 3*).—The author presents the results of work extending through the fall of 1923 and the following winter and spring and employing the bean rust organism (*Uromyces appendiculatus*), with the object of observing the physiological reactions of the parasite when grown on leaves or portions of leaves detached from the host and floated on solutions in Petri dishes. Implications from the results as recorded are discussed. It was repeatedly noted that the disappearance of food was followed by the appearance of teliospores, though no final conclusions are attempted.

Dusting versus spraying of celery, G. P. CLINTON (*Conn. Veg. Growers' Assoc. Rpt. 1924, pp. 54–65*).—This report contains an account, with discussion, of tests to control celery blight by dusting and spraying, also a list of fungus, bacterial, and nonparasitic troubles arising previously in connection with vegetable raising in Connecticut.

Observations on clover rot (Sclerotinia trifoliorum Eriks.), S. M. WADHAM (*New Phytol., 24, (1925), No. 1, pp. 50–56, figs. 2*).—The mycelium of *S. trifoliorum* is readily cultivated and forms sclerotia on various media. The sclerotia are very resistant to temperature and desiccation. Exact control of the development of apothecial shoots has not been obtained. The spores produce mycelium which is at first saprophytic and later facultatively parasitic. The spores probably germinate on vegetable detritus on the soil. The mycelium spreads over the ground at a rate depending on the atmospheric conditions at the soil level, which are in their turn affected by the density of the crop.

Plant pathology and physiology (*Texas Sta. Rpt. 1926, pp. 45–48*).—Studies have been continued on the cotton root rot disease, attention being particularly given to the destruction of the host by the organism. It was found that the effect is correlated with the time of the year when infection takes place. When young seedlings are infected early in July they are said not to die immediately after the roots have become attacked, but they alternately wilt and revive for a period of from 4 to 10 weeks before the plant finally collapses.

An effort was made to determine whether the fungus spreads other than by root contact, and it was found that the spread of the causal organism from one plant to another was not as rapid as formerly believed. The spread seems to be influenced by the age of the plant and possibly by the concentration of the plant sap, and also by the season. An effort was made to determine the tolerance of the fungus to an alkaline or acid medium, and the studies seem to

indicate that it may be possible to control root rot in some soils by changing their reaction either to a point of acidity below pH 4 or a point of alkalinity above pH 9.

Morphological studies were made of the fungus, and the various stages which take place in the development and formation of the spore were ascertained.

Experiments at one of the substations have shown that no form of sulfur can be used for the control of powdery and downy mildew of cantaloupes without serious burning injury. So far no fungicide has been found which can be recommended for the control of these diseases that will not injure the foliage.

Investigations of cucumber mosaic, S. P. DOOLITTLE and M. N. WALKER (*Canner, 63 (1926), Nos. 18, pp. 25–27; 19, pp. 21, 22*).—Information collected and experimentation described point to the possibility of controlling cucumber mosaic through the eradication of wild hosts of the infective agent. This plan is favored by dusting or spraying to keep down the cucumber aphis and the striped beetle. By such means the appearance of mosaic is delayed from two to four weeks, or more, which delay may mean a fair or good crop instead of a poor one.

Pseudoperonospora humuli and its mycelial invasion of the host plant, W. M. WARE (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 91–107, figs. 4*).—An account of the discovery and investigation of the hop downy mildew (*P. humuli*) shows that hyphae are present within the cortex and pith of the stem of spiked growths from the rootstock and that they are also present in 1-year-old parts of the rootstock. Mycelium is found in the longer bines, but it is not necessarily continuous, as healthy internodes and even intermediate nodes may occur. Mycelium has not been observed at the base of such longer bines. The fungus is present during winter in the pith, phloem, and cortex of nursery sets and has been found in the cortex of the roots. Oospores occur plentifully in the pith or terminal and lateral spikes and within the bracts and bracteoles of the cone.

Diseases of head lettuce in Minnesota, J. G. LEACH and H. C. GILBERT (*Minn. Univ. Agr. Ext. Spec. Bul. 106 (1926), pp. 10, figs. 9*).—Popular descriptions and suggested means for control are given of lettuce drop caused by *Sclerotinia sclerotiorum*; gray mold (*Botrytis* sp.); tipburn, a nonparasitic disease; and downy mildew, due to *Peronospora lactucae*.

Nanism and deterioration in lupines following fertilization with calcium cyanamide [trans. title], B. PEYRONEL (*R. Staz. Patol. Veg. [Rome], Bol. Mens., 5 (1924), No. 1–6, pp. 20–26*).—Calcium cyanamide as a fertilizer proved injurious to lupines.

[Potato varieties tested for resistance to blight], SIMONET (*Jour. Soc. Natl. Hort. France, 4. ser., 26 (1925), July, pp. 272–274*).—Trials were carried out in two series of experiments testing, for resistance to pure culture *Phytophthora infestans*, 17 potato varieties selected as among the more popular in France. A serial arrangement shows as the results of these two tests a summative (average) low degree of resistance for the varieties Saucisse and Green Mountain and a higher degree for Bravo and Rouge du Soissonnais, with 10 intermediate classes.

The biology of Rhizoctonia on potato [trans. title], B. PEYRONEL (*R. Staz. Patol. Veg. [Rome], Bol. Mens., 5 (1924), No. 1–6, pp. 4–19, figs. 2*).—*R.* (*Hypochnus*) *solani* is widely diffused in Italy, many varieties of potato serving as hosts, some being much more seriously attacked than others. Dryness is an important cause of susceptibility to attack by this fungus.

The stipple-streak disease of potato, a complex problem, D. ATANASOFF (*Izv. B''lgarsk. Bot. Druzh. (Bul. Soc. Bot. Bulgarie), 1 (1926), pp. 43–52*).—

All potato varieties studied were readily subject to infection with stipple-streak disease, though affected in widely different degrees and with a corresponding range as to symptoms. Running-out, due to stipple-streak, may be very rapid or slow, mild or severe. Bravo, Eigenheimer, and Roode Star were infected with what is called crinkle or mosaic, and the question is raised as to whether this trouble may not be due to a form or degree of stipple-streak. Zeenwsche Blauwe carried and transmitted the virus of stipple-streak, without itself, however, showing any sign of the disease. The existence of such varieties may explain cases of the supposed carrying of the disease by neighboring wild plants. The culture of a number of potato varieties on a field scale appears to constitute a danger to potato growing locally. It is thought that 10 varieties would be sufficient for this area.

Potato wart [trans. title], E. Foëx (*Jour. Soc. Natl. Hort. France, 4. ser., 26 (1925), Aug., pp. 309–369*).—In compact and systematic form, a somewhat comprehensive account is given of potato wart (*Synchytrium endobioticum*) as regards times of outbreak in different places, present geographical distribution, characteristics of the disease, the propagation, perpetuation and dispersal of the causal organism, and attempts at control of the disease in different localities. A tendency to rely on the development of resistant or immune varieties is apparent. Lists of varieties arranged according to degrees of resistance for different areas are given. Legislation in different places to prevent or hinder the spread of potato wart is outlined. The potato-wart situation in France is specifically reviewed.

Cercospora of sugar beet in 1924, G. Mori (*La Cercospora della Barbabietola da Zucchero nel 1924. Genova: Narcisi & Co., 1925, pp. 61, figs. 15*).—Beet-root culture in Italy suffered serious loss in 1924 from *C. beticola*. The situation is discussed systematically, with a view to practical control.

Beet heart rot [trans. title], E. Gäumann (*Beibl. Vrtljschr. Naturf. Gesell. Zürich, 70 (1925), No. 7, pp. 1–106, figs. 20*).—In Switzerland beet heart rot appears in particularly severe form on improved peat soils. The only organism consistently isolated from heart-rot beets is *Phoma betae*. This regularly reproduces the disease after inoculation on beets in soils having a pH value of 7.8, though beets in soils having pH 6.6 showed no such results. Various differences and disturbances are noted.

The Micromycetes affecting beet roots in 1924 [trans. title], Neuwirth (*Ztschr. Zuckerindus. Čechoslovak. Repub., 49 (1925), Nos. 48, pp. 403–410, figs. 8; 49, pp. 479–486, figs. 10*).—A systematic arrangement, with discussion, is given of parasitic fungi of beets as studied during 1924.

Nematodes parasitizing beet root [trans. title], J. del Cañizo and J. R. Sardiña (*Bol. Estac. Patol. Veg. [Inst. Agr. Alfonso XII, Madrid], 1 (1926), No. 2, pp. 48–52, figs. 3*).—Injury to beet roots by parasitic nematodes in Spain is briefly dealt with, the organisms found being *Heterodera radicicola* or *H. schachtii*.

The life history, habits, and economic importance of some mononchs, G. Thorne (*Jour. Agr. Research [U. S.], 34 (1927), No. 3, pp. 265–286, figs. 6*).—The results are given of a study of the predacious nematodes of the genus Mononchus in sugar-beet fields in Idaho and Utah that were infested with *Heterodera schachtii*.

The principal species found were *M. papillatus*, *M. macrostoma*, *M. sigmaturus*, and *M. parabrachyurus*. These species were found to occur in sugar-beet fields infested with the sugar-beet nematode *H. schachtii*. They are said to prefer the lighter sandy soils where they were sometimes found in populations as high as 800,000,000 per acre. In the heavy soils they occurred less frequently.

The general habits in relation to temperature, moisture, food supply, diseases, and enemies were also studied.

M. papillatus was found to be the most voracious species and frequently was observed devouring the larvae and males of *H. schachtii*. Because of their unstable populations, time of reproduction, and food habits it is considered doubtful if the mononchs studied were of economic importance in the control of the sugar-beet nematode.

Disease investigations [Queensland] (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 25 (1925), pp. 23–26*).—W. Cottrell-Dormer is credited with the present report on cane diseases studied under the guidance of D. S. North. The report deals briefly with sugar cane gumming disease (*Bacterium vascularum*), leaf scald (bacterial), leaf stripe or downy mildew (*Sclerospora sacchari*), mosaic, top rot, red rot (*Colletotrichum falcatum*), and minor diseases.

The cane disease situation, H. H. Storey (*So. African Sugar Assoc. Ann. Cong. Proc., 4 (1926), pp. 69–73*).—In this lecture the author principally sums up the situation as regards sugar cane mosaic and, as related thereto, the matter of streak disease, which complicates further the problem of cane mosaic control.

Soil hygiene in its relation to disease of cane, I, II, M. Bird (*Planter and Sugar Manfr., 76 (1926), Nos. 2, p. 30; 3, p. 51*).—The author records a case of wilting and dying of sugar cane thought to be due to a so-called unhygienic condition of the soil, which is described, and not to a disease.

Root knot on sugar cane in Porto Rico, J. Matz (*Planter and Sugar Manfr., 76 (1926), No. 1, p. 9*).—Sugar cane root knot in Porto Rico has been controlled at least measurably in one case of cane, growing on a porous soil consisting of about an 8-in. top black layer underlaid with several feet of brown sand and coarse gravel, by applying a layer of barnyard manure to the roots of the cane and then covering this with soil, after which the field was kept moist by frequent irrigation. The plants developed a new root system in a new and fertile soil layer.

The root disease complex of sugar cane, H. P. Agee (*Planter and Sugar Manfr., 77 (1926), No. 18, pp. 347, 348*).—An account is given of the sugar cane disease that was originally termed "Lahaina," from the cane of that name which began to fail on Oahu about the year 1910. Substitute varieties are discussed.

Fungus root rots in relation to Lahaina growth failure, H. A. Lee, D. M. Weller, and C. C. Barnum (*Planter and Sugar Manfr., 77 (1926), No. 20, pp. 388, 389, figs. 2*).—The true infectious sugar cane root rots are here considered in connection with mention of the failure of Lahaina cane known formerly as the Lahaina disease, and studied then as a single disease believed to be root rot but more recently known to be due to a variety of agencies.

Soil disinfectants do not appear promising as compared with natural control by such means as resistant varieties, or such treatments as the addition of organic matter to the soil.

Nematodes considered in relation to root rot of sugar cane in Hawaii, F. Muir (*Planter and Sugar Manfr., 77 (1926), No. 19, pp. 370, 371*).—Within the tissues of sugar cane roots there are found eight nematodes, and in soil around the roots six more. These are discussed. In Hawaii, the predacious nematodes of the genus Mononchus have been found only in spots that are high in organic material. This suggests another argument for increase of soil humus.

New and unusual diseases and injuries of tobacco, C. M. Slagg (*Sci. Agr., 6 (1926), No. 6, pp. 193–198, figs. 6*).—New and unusual tobacco diseases and

injuries briefly discussed include curly dwarf, irrigation injury, stalk-borer injury, blasting injury, and a leaf and stem disease attributed to a Fusarium closely resembling *F. affine*.

Two water molds causing tomato rootlet injury, C. DRECHSLER (*Jour. Agr. Research [U. S.], 34 (1927), No. 3, pp. 287–296, figs. 2*).—The author reports having found two water molds which cause discoloration and death of occasional rootlet tips of tomato seedlings in greenhouses. One was identified as *Aphanomyces euteiches*, which is known as a cause of root rot of peas, and the other is described as *Plectospira myriandra* n. g. and sp.

Studies on tomato wilt caused by Fusarium lycopersici Sacc., R. P. WHITE (*Jour. Agr. Research [U. S.], 34 (1927), No. 3, pp. 197–239, pls. 9, figs. 9*).—The results are given of a study of 24 strains of *F. lycopersici* isolated from wilted tomatoes received from various parts of the country. In the experiments the form isolated from each lot of diseased tomatoes was considered as a strain. An attempt was made to correlate temperature and H-ion concentration with growth and different degrees of pathogenicity. Studies were also made of carbon sources, method of utilization of carbon sources, and the production and isolation of toxic substances produced as a result of growth upon synthetic media.

In a general way different degrees of pathogenicity were found to be correlated with temperature relations and growth rates, but these facts could not be correlated with very evident differences expressed by the strains toward the H-ion concentrations of the substrate upon which they were being grown. From a study of the temperature relations and growth rates, the strains were found to fall into two groups, one group with a wide temperature range and more rapid growth rates, consisting of five strains, and the other group with a more limited temperature range and slower growth rates. A study of the H-ion relations is said to indicate that it is impossible to group the strains or to correlate them with the differences found in virulence, growth rates, temperature relations, or cultural characters.

When *F. lycopersici* was grown on a modified Richards' solution, it was found to produce substances highly toxic to cut tomato plants. The toxic substances were separated into two classes, the first colloidal, thermolabile, and of the nature of an enzyme, and the second crystalloidal, dialyzable, thermostable, volatile, and nonvolatile. Salts of organic acids were found present in old culture solutions, and organic acids were proved to be highly toxic to tomato plants. Plants of a resistant strain of tomato were found to be less subject to injury from the toxic materials than those of a susceptible variety. The toxic substances produced by *F. lycopersici* also caused wilting of cowpea, soy bean, and cabbage. The toxic substances produced by *F. oxysporum* caused wilting of tomato plants.

Dusting for the control of orchard diseases, H. H. WHETZEL (*Ind. Hort. Soc. Trans., 1925, pp. 92–106*).—A review as to principles and practice is given regarding control of orchard diseases. This is supplemented by discussion.

Dusting as a factor in commercial orcharding, W. S. BROCK (*Ind. Hort. Soc. Trans., 1925, pp. 106–112*).—Dusting for control of orchard diseases and pests is here dealt with as applying to that portion of the Mississippi Valley where conditions parallel or approximate those in Illinois.

Orchard spraying experiments: Apple scab and apple blotch (*Ohio Sta. Bul. 402 (1927), pp. 74–76*).—Spraying tests covering a period of five years are reported, from which it appears that commercial lime-sulfur solution and commercial dry lime sulfur (powdered form) gave higher percentages of fruit free from scab than did standard Bordeaux mixture. In blotch control lime-

sulfur sprays gave nearly as high percentages of sound fruit as did standard Bordeaux, and the apples from plats sprayed with lime sulfur, both in scab and blotch prevention work, were far superior in color and appearance to those from plats sprayed with standard Bordeaux.

Beginning with the second season of the spraying tests, Bordeaux mixture of varying strengths was used. It was found possible to reduce the amount of copper sulfate to one-third or one-fourth of the weight generally recommended without materially affecting the efficiency of the fungicide.

Sulfocide, a concentrated compound, was used in the proportion of 1 gal. to 200 gal. of water for two seasons in spraying experiments for the prevention of apple scab and apple blotch, and it gave an average of 91.5 per cent of scab-free and 96.8 per cent of blotch-free fruit. The fungicide was applied, in accordance with directions, with an adhesive and lead arsenate, but there was some burning of foliage and injury to the calyx lobes of the fruit. Colloidal sulfur used for three years in the tests gave 86.2 per cent fruit free from scab and 86.8 per cent free from blotch.

Spraying tests for the control of apple blotch, M. W. Gardner, L. Greene, C. E. Baker, et al. (*Ind. Hort. Soc. Trans., 1925, pp. 134–147, fig. 1*).—Apple blotch control trials are here dealt with as made on the Northwestern variety at Knightstown, in central Indiana, 1922, and on the Oldenburg variety at Mitchell, in southern Indiana, in 1921–1925, records being taken as to infection of petiole, twig, and fruit.

Although the petal-fall date varied in different seasons, sprays applied at petal-fall and 2, 4, and 6 weeks thereafter gave satisfactory control each season without any indication that later or more frequent applications might be necessary. For the petal-fall spray lime sulfur was sufficient, except in 1922, when a 2–4–50 Bordeaux mixture proved much more effective. For the 2, 4, and 6 weeks sprays a 2–4–50 or 2–6–50 Bordeaux spray proved as effective as the 4–6–50 strength and more reliable than lime sulfur in three seasons out of five. The 1–3–50 Bordeaux was not so effective as the 2–6–50 spray in 1924. Evidence of cumulative beneficial effect of spraying during previous seasons was obtained, though considerable infection occurred even in those trees in which good canker prevention had been secured during the three preceding years. In the Northwestern variety only the Bordeaux sprays gave a cumulative beneficial effect.

Water conduction in apple trees affected with crown gall, J. H. Muncie and C. Berkhout (*Iowa Acad. Sci. Proc., 31 (1924), pp. 143–147, figs. 2*).—A study of water conduction in healthy apple wood and in corresponding crown gall portions showed a slower average rate of movement through the galls. A histological study of the galled portions showed abnormalties in the ducts, which were deflected or twisted, and in some cases ended blindly within the gall tissue.

On a core rot and premature fall of apples associated with Sclerotinia fructigena, W. J. Dowson (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 155–161, pl. 1, fig. 1*).—An internal rotting of certain apple varieties, which occurred in 1925 in the Royal Horticultural Society Gardens at Wisley, Surrey, usually showed externally as a small soft brown patch at either end of the core. The fungus which was isolated appears, from careful study, to belong to *S.* (*Monilia*) *fructigena*. It is not yet certain that other organisms, as bacteria, may also be involved.

Pink rot of fruits [trans. title], Simonet (*Jour. Soc. Natl. Hort. France, 4. ser., 27 (1926), Feb., pp. 93, 94, fig. 1*).—*Cephalothecium roseum* is said to cause, besides a pink rot of different fruits, a disease of stone fruits, and to attack saprophytically cones of *Pinus armandi*.

Biochemistry of plant diseases.—V, Relation between susceptibility to brown rot in plums and physical and chemical properties, J. J. Willaman, N. C. Pervier, and H. O. Triebold (*Bot. Gaz., 80 (1925), No. 2, pp. 121–144, figs. 10*).—In previous articles of this series (E. S. R., 50, pp. 47, 48) it was noted that, though plum varieties resistant or susceptible to *Sclerotinia cinerea* differed in regard to such qualities as sap density, H-ion concentration, oxalic acid, ash, nitrogen, lime, and ether extract content, the small differences hardly accounted for the resistance properties. Crude fiber, however, was conspicuously higher in the two resistant than in the two susceptible varieties, and this fact suggested a physical difference in the texture of the fruit as the basis for the property of resistance. This hypothesis was tested with 11 varieties at six stages of ripeness during 1922 and 1923, and the results are reported in the present paper as regards crude fiber, pentosans, and dry matter.

In general, the more resistant varieties have the higher crude fiber content, particularly in the riper stages of maturity. Pentosan content shows the same general relations, in less degree, to susceptibility as does crude fiber content. Decrease of skin toughness as ripeness advances is more marked in the susceptible varieties, this fact agreeing with alteration in susceptibility to brown rot. Firmness of flesh parallels remarkably the toughness of the skin at all stages. "Unquestionably both factors are of importance in conferring resistance on a variety."

At ripeness, and especially during overripeness, all varieties become susceptible to brown rot.

"Coefficients of correlation by rank were calculated for all pairs of factors, and for all stages of maturity, for the 1923 samples. The values obtained verify the generalizations consistently."

Studies in raspberry diseases: Mosaic, leaf curl, rosette, and wilt, G. H. Berkeley and A. B. Jackson (*Canada Dept. Agr. Pamphlet 72, n. ser. (1926), pp. 15, figs. 6*).—These raspberry disease studies are in three parts, dealing respectively with mosaic and leaf curl, rosette or bramble streak, and Verticillium wilt due to *V. ovatum*.

For mosaic, leaf curl, and rosette, the preventive measures include only the use of certified stock, roguing where mosaic incidence does not exceed 5 per cent, and in case infection exceeds 5 per cent, removal of all plants. The limited knowledge regarding Verticillium wilt control suggests only the use of certified stock or immune varieties, avoidance of soils recently cropped to susceptible plants (potato, tomato, and eggplant), or employment of a 4-year rotation.

A new Saccharomycete of Indian fig. [trans. title], **R. Ciferri** (*Staz. Sper. Agr. Ital., 56 (1923), No. 4–6, pp. 237–243*).—An account, with technical description, is given of *Zygosaccharomyces opuntiae* n. sp. on the cactus *Opuntia ficus indica*.

[The control of fig rust] (*Texas Sta. Rpt. 1926, p. 19*).—Spraying experiments, in which a 5–5–50 Bordeaux mixture was applied every 30 days, are said to have given promising results for the control of fig rust. Reducing the interval between the sprays to 15 days or increasing the strength of the Bordeaux mixture gave no better results.

Olive knot [trans. title], **J. del Cañizo** (*Bol. Estac. Patol. Veg. [Inst. Agr. Alfonso XII, Madrid], 1 (1926), No. 2, pp. 67–69, figs. 2*).—Olive knot or tubercle, commonly found in olive-growing areas and said to be caused by *Bacterium savastanoi*, is measurably controlled by fungicidal applications, some of which are mentioned.

Olive knot [trans. title], A. BONANNI (*Staz. Sper. Agr. Ital., 56 (1923), No. 1–3, pp. 124–144, pls. 2*).—Studies on the organism causing olive knot or tubercle are said to have confirmed studies by Smith (E. S. R., 20, p. 249) on material from California regarding the agency in this connection of *Bacterium savastanoi*. Earlier conclusions by Smith are mentioned (E. S. R., 17, p. 1165).

Areca palm disease in Ha-tinh [trans. title], J. BATHELLIER (*Bul. Écon. Indochine, n. ser., 29 (1926), No. 178, pp. 159–165, fig. 1*).—An unthrifty condition eventuating in the death of areca palms is described. The cause appears to be a Micrococcus. The reaction of the plant to the disease is briefly described.

Panama disease in Jamaica, C. G. HANSFORD (*Jamaica Dept. Sci. and Agr., Microbiol. Circ. [5] (1926), pp. [2]+35*).—Panama disease is here dealt with as regards its local history, distribution, external and internal symptoms, and cause. A description is given of the fungus, *Fusarium cubense*, with an account of the disease in the field, the influence of other factors, spread, control measures, resistant varieties, and the present situation in Jamaica. Appendixes deal with several related matters of importance.

Progress report on citrus blight investigations, A. S. RHODES (*Fla. State Hort. Soc. Proc., 39 (1926), pp. 143–146*).—Citrus blight is believed, as the result of investigations so far conducted, to be a purely physiological trouble caused by extremes in soil moisture conditions, rather than by a disease in the usual sense of a pathogenic organism. Neglect may be a factor.

Gummosis of citrus trees, M. N. KAMAT (*Poona Agr. Col. Mag., 17 (1925), No. 2, pp. 86–88*).—Citrus tree gummosis, yielding as isolations a Fusarium and in a few cases bacteria, was tested in 1922 as to control measures. These included (1) painting the wounds with a paste made up of 1.5 lbs. of copper sulfate and 1 lb. of quicklime with 2 gal. of water (which is said to have given satisfactory results) and (2) scraping off wounded tissue, cleaning the wounds with a strong jet of pure water, and painting the wounds with a 50 per cent solution in water of crude carbolic acid, the wounds then being covered with coal tar. This second treatment is to be repeated a month later if necessary.

Something new about melanose, F. A. WOLF (*Fla. State Hort. Soc. Proc., 39 (1926), pp. 153, 154*).—The author reports that a winter, dormant, or hibernating (ascogenous) stage has been found of the fungus (summer stage *Phomopsis citri*) causing citrus melanose. The significance of this discovery is briefly discussed. The winter stage occurs on fallen and decayed twigs of lime, grapefruit, seedling orange, and tangerine. It may be found at any time during the year. A detailed study of this stage is said to indicate that it should be included in the genus Diaporthe, and the name *D. citri* is applied to it.

A preliminary account of a disease of green coffee berries in Kenya Colony, J. MCDONALD (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 145–154*).—The coffee berry disease, which, since 1922, has caused in two districts of Kenya Colony losses ranging in some cases as high as 75 per cent, is described as to symptoms and conditions of occurrence. A fungus isolated and found on reinfection to produce the disease is indistinguishable as to its fructifications from *Colletotrichum coffeanum*. Comparisons have been made between the growth in artificial culture of this fungus and that of other strains of Colletotrichum from coffee, and the possible relationships are discussed.

Spraying with Bordeaux mixture or carbide Bordeaux mixture (a substitute said to be equally efficient, in which lime is replaced by calcium carbide when good lime is not available) has proved effective in controlling coffee berry disease.

[Fungi injurious to forest trees], T. DIMITROV (DIMITROFF) (*Izv. B''lgarsk. Bot. Druzh.* (*Bul. Soc. Bot. Bulgarie*), *1* (*1926*), *pp. 53–66; Fr. abs., p. 66*).—Fungi regarded as causing forest injury, to the number of 38 species in 14 families, are discussed.

Forest protection—diseases, E. P. MEINECKE (*Jour. Forestry, 23* (*1925*), *No. 3, pp. 260–267*).—A review and estimate as to the outlook regarding forest protection against diseases.

Forest protection—diseases.—Comment on Meinecke's paper, J. S. BOYCE (*Jour. Forestry, 23* (*1925*), *No. 3, pp. 268, 269*).—A brief comment on the paper noted above.

Fumigating and sterilizing tree seed, W. METCALF (*Jour. Forestry, 23* (*1925*), *No. 5–6, pp. 508–512*).—As the result of 10 tests made with different sterilizing treatments used on seed of Coast redwood (*Sequoia sempervirens*), as here briefly described, bichloride of mercury appeared to be the most desirable seed treatment. It gave absolute protection against disease organisms, though in experimentation (considered as not representative) with seeds of jack pine it lowered germination severely.

Bacterial leaf spot of betel, C. RAGUNATHAN (*Ceylon Dept. Agr. Leaflet 39* (*1926*), *pp. 2, figs. 2*).—Since 1896 specimens of betel bacterial leaf spot have been received from various parts of Ceylon. Since 1921 the disease has caused considerable damage in parts of the low country, as it appears to be favored by damp conditions.

A gummy fresh-leaf exudation swarms with bacteria. These have been shown to cause the disease, and have been claimed to constitute a new species under the name *Bacterium betle*.

Chestnut disease, R. BLANCO (*Apuntes sobre la Enfermedad del Castaño. Lugo, Spain: Cons. Prov. Fomento, 1925, pp. 34*).—A compact account, with brief bibliography, is given regarding chestnut blight, due to *Endothia parasitica*.

Causes of dying out of oak forests [trans. title], V. ŠKORIĆ (*Glasnik Šumske Pokuse* (*Ann. Expt. Forest.*) [*R. Univ. Zagreb Inst. Expt. Forest.*], *1* (*1926*), *pp. 234–246, pls. 2, fig. 1; Eng. abs., pp. 243–245*).—After defoliation of forest oaks by *Liparis dispar*, *L. Chrysorrhea*, and *Malacosoma neustria*, the new leaves which appeared were severely attacked by the oak powdery mildew *Microsphaera alphitoides* under the conditions, then prevailing, of dry air, increased light, and temperatures near the optimum. Species of Xyleborus and Platypus attacked the weakened trees, and these insects also gave entrance to such fungi as *Agaricus melleus*. The widespread destruction of the forest oaks is ascribed to such associated causes.

Death of oaks in Croatia and Slavonia [trans. title], A. PETRAČIĆ (*Glasnik Šumske Pokuse* (*Ann. Expt. Forest.*) [*R. Univ. Zagreb Inst. Expt. Forest.*], *1* (*1926*), *pp. 119–127; Ger. abs., pp. 126, 127*).—An account of the dying out of forest oaks in Croatia and Slavonia is given from the standpoint of forestry. The trouble seems to be due primarily to the presence of oak mildew, but a decisive part is probably played by the honey fungus (*Agaricus melleus*) in connection with insect attacks.

***Armillaria mellea* in the oak woods of Yugoslavia** [trans. title], P. GEORGEVITCH (*Biol. Gen., 2* (*1926*), *No. 4–5, pp. 530–536, pls. 2*).—It is stated that a primary cause of the dying out of oaks is the presence of *A. mellea*, which appears able to attack the oaks parasitically without a previous saprophytic stage.

The white pine blister rust in Germany, P. SPAULDING (*Jour. Forestry, 24* (*1926*), *No. 6, pp. 645–652*).—"In a series of articles in the German forestry press ranging in date from 1914 to the present time, a controversy has been

waged as to the more extended use of the five-needled pines in the forests of Germany, between Harrer and Prof. Tubeuf. This controversy centers around the species *Pinus monticola*."

Response of the genus Rhamnus to Puccinia coronata Corda, S. M. Dietz (*Iowa Acad. Sci. Proc., 31 (1924), pp. 130, 131*).—All of the several species and varieties of Rhamnus exposed to *P. coronata* show susceptibility. An account is given of infection tests and responses.

Three kinds of thread blight on Hevea brasiliensis [trans. title], K. B. Boedijn (*Arch. Rubbercult. Nederland. Indië, 10 (1926), No. 8, pp. 369–376, fig. 1; Eng. abs., pp. 374–376*).—Three forms of thread blight affecting Hevea in Sumatra are described, one of these in connection with the causal fungus, *Corticium salmonicolor*. Thread blight here is usually sporadic and reqnires no treatment. When it occurs too abundantly it is usually sufficient to remove and burn the young portions which are affected. Older portions may be painted with Izal (3 per cent), Corbolineum (5 per cent), or some other of the usual disinfectants.

Successional disease in plants as shown in willow rods, N. L. Alcock (*Brit. Mycol. Soc. Trans., 11 (1926), pt. 1–2, pp. 161–167, fig. 1*).—The failure of resistance to disease in plants may be due to unsuitable environment, mismanagement or injury, to neglected attacks of minor ailments, or (occasionally) to exceptional virulence in a specific disease. Failure in such ways is said to be instanced by the occurrence of four diseases, which are here described.

Willow scab is actively parasitic like apple scab. Its attacks on willow rods are assisted by faulty methods of cutting. The three diseases in succession on the crack willow show how one disease leads to another and how the weakened plant ceases to have its full power of resistance. The willow scab (*Fusicladium saliciperdum*) is a strong parasite, possibly the most active of the four. The second of these (*Cryptomyces maximus*) is also a parasite. *Scleroderris fuliginosa* is a semiparasite. *Myxosporium scutellatum* is hardly a parasite, mostly a saprohyte. All of these were injuring trees on which they were found.

The house fungus, Merulius lacrymans (Jacq.) Fr., W. H. Davis (*Iowa Acad. Sci. Proc., 31 (1924), pp. 169–173, fig. 1*).—*M. lacrymans* caused extensive and expensive rotting, apparently within two to four years, in a damp church basement floor and adjacent structure in Amherst, Mass. Whitewood, southern pine, white pine, and spruce were rotted and useless in about one year. Poplar was also rotted, but chestnut resisted the fungus.

When is rot not rot? W. H. Long (*Amer. Wood Preservers' Assoc. Proc., 21 (1925), pp. 202–219*).—The present paper is offered as a progress report on work bearing upon the advisibility of using (after treatment) crosstie material showing certain amounts and kinds of discoloration or other apearances indicating or suggesting rot and weakening of the ties.

The tests are held to prove conclusively that the treatment of the high altitude conifer species given at the tie-treating plant at Albuquerque thoroughly sterilized all rot present. The treatment given the Texas pine sterilized the bulk of these ties, but the usnal treatments given western yellow pine will have to be modified. The results from the semitreated rot prove that the preservative does not kill the various fungi present, and hence raise a doubt as to the protective value in sound ties when the heartwood is only semitreated.

Methods of testing the relative toxicity of wood preservatives, C. A. Richards (*Amer. Wood Preservers' Assoc. Proc., 19 (1923), pp. 127–135*).—The author tabulates the methods of 14 authors, indicating the medium, container,

and fungus or fungi used in each of the different studies, with commentary. He prefers the Petri-dish method to any other laboratory method to test toxicity, though admitting that it is simply an indicator method, and that the conditions of the test do not approach those in service tests.

The dry rot disease of gladioli, F. L. Drayton (*Sci. Agr., 6 (1926), No. 6, pp. 199–209, figs. 7*).—Increasingly important losses due to gladiolus disease in Canada are thought to be occasioned largely by dry-rot, the causal organism of which has not as yet been satisfactorily classified. The fungus persists in diseased soil for a number of years. Measures recommended are outlined, looking to control of this disease. The lesions, which may be seen, indicate the necessity for the elimination of diseased corms. Soaking of corms in 5 per cent formalin for 30 minutes will protect against infection from adhering soil or corm scales from diseased plants.

Outbreak and spread in Italy of Colletotrichum omnivorum on Aspidistra lurida [trans. title], G. Campanile (*R. Staz. Patol. Veg. [Rome], Bol. Mens., 5 (1924), No. 7–12, pp. 60–66, figs. 3*).—An attempt at a complete description is made regarding *C. omnivorum* as noted in living leaves of *A. lurida*.

Brown leafspot of leather leaf fern, F. A. Wolf (*Jour. Elisha Mitchell Sci. Soc., 42 (1926), No. 1–2, pp. 55–62, pls. 2*).—A reddish-brown leaf spot disease of leatherleaf fern (*Polystichum adiantiforme*) was shown to be caused by a Cylindrocladium, said to be new and herein described as *C. pteridis*. Artificial inoculations succeeded on *P. adiantiforme*, also on *Dryopteris normalis* and *Nephrolepsis exaltata*.

A polyphagous parasite, Valdensia heterodoxa n. g. and sp. [trans. title], B. Peyronel (*Staz. Sper. Agr. Ital., 56 (1923), No. 10–12, pp. 521–538, figs. 15*).—*Vaccinium myrtillus* is dealt with as the principal (host) victim of a parasitic fungus regarded as a new genus and species and named *V. heterodoxa*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

An outbreak of house mice in Kern County, California, E. R. Hall (*Calif. Univ. Pubs. Zool., 30 (1927), No. 7, pp. 189–203*).—This is a detailed account of an outbreak of house mice in Kern County which was investigated by the author in January, 1927. The account gives a description of the region, time of outbreak, source and numbers of mice, economic bearings, and biological inferences. The causes of this overabundance of mice are said to include favorable meteorological conditions, abundant food and shelter, and the removal of the principal natural enemies of small rodents that normally hold their numbers in check. The destruction of their food and shelter is considered to have been the factor determining the time of the spectacular emigration of the mice.

Birds, N. Blanchan (*[Garden City, N. Y.]: Doubleday, Page & Co., 1926, pp. XII+257, pls. 49*).—Practical, summarized, illustrated accounts are given of the common birds of the eastern United States.

The relation of birds to woodlots in New York State, W. L. McAtee (*Roosevelt Wild Life Bul. [Syracuse Univ.], 4 (1926) No. 1, pp. 5–152, pls. 4, figs. 22*).—This is a contribution from the U. S. D. A. Bureau of Biological Survey.

Birds of the Cartagena Lagoon, Porto Rico, S. T. Danforth (*Jour. Dept. Agr., Porto Rico, 10 (1926), No. 1, pp. IX+136, pls. 24*).—At Cartagena Lagoon and its immediate vicinity 105 species of birds were found. Of these, 42 are migrants from North America and another 42 species breed there either regularly or occasionally. Two breed in Porto Rico and winter in South America, and it is quite possible that a third does likewise. It was found that only

21 species come to the Lagoon to feed, though breeding in other parts of the island.

The birds beneficial to agriculture, A. MENEGAUX (*Les Oiseaux Utiles à l'Agriculture. [Paris]: Soc. Ornithol. France, 1925, pp. 24, pls. 2, figs. 16*).—A brief practical account.

Transmission of Treponema crocidurae by two species of Ornithodorus (O. moubata and O. marocanus) [trans. title], E. BRUMPT (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 23, pp. 1139–1141*).—The author reports briefly upon two experiments to show that the spirochete *T. crocidurae*, which is common in the shrew *Crocidura stampfli* of Dakar, is transmitted by the ticks *O. moubata* and *O. marocanus*.

Comparative studies on furcocercous Cercariae, H. M. MILLER, JR. (*Ill. Biol. Monog., 10 (1926), No. 3, pp. 112, pls. 8, figs. 2*).—Following the introduction the author presents an historical review (pp. 8–29), a description of species and comparison with related forms (pp. 30–58), classification (pp. 59–73), check list of furcocercous Cercariae (pp. 74–77), discussion of life histories (pp. 78–80), incidence of infection of snails (pp. 81–83), summary of results (p. 84), and bibliography (pp. 85–92).

A great menace—the rising tide of insects, L. O. HOWARD (*Sci. Amer., 136 (1927), No. 2, pp. 114, 115, figs. 5*).—A popular presentation of the subject.

The principles of biological control in economic entomology, I, II, R. J. TILLYARD (*Nature [London], 119 (1927), Nos. 2988, pp. 202–205; 2989, pp. 242, 243*).—This is a lecture on the principles of biological control, particularly as applied to New Zealand conditions. Following a general discussion of the control of injurious insects in this manner, the author deals with the practical control of the woolly aphid by *Aphelinus mali*, the pear-leaf curling midge *Perrisia pyri*, the European earwig, the oak scale *Asterolecanium variolosum*, introduced aphids in general, pear slug, sheep-maggot flies, and the coconut moth *Levuana irridescens*. The second part of this paper deals with the control of injurious weeds.

Insecticides and fungicides, C. C. GOWDEY (*Jamaica Dept. Agr., Ent. Circ. 12 (1927), pp. 12*).—This practical account includes 46 formulas.

Fruit insect problems for 1925, E. N. CORY (*Peninsula Hort. Soc. [Del.] Trans., 39 (1925), pp. 34–38*).—A brief discussion of the more important fruit pests, particularly the oriental peach moth.

Insects and mammals of interest to forestry, A. RIESGO ORDOÑEZ (*Insectos y Mamiferos de Interes Forestal. Madrid: [Lab. e Insect. Fauna Forestal Española], 1925, pp. 80*).—A brief account is given of the more important insect (pp. 5–48) and mammal (pp. 49–77) enemies of forestry in Spain.

Insects and parasites affecting livestock (*Texas Sta. Rpt. 1926, p. 26*).—In the cooperative work conducted it was found that the sheep scab mite does not live off the host for more than several weeks. Dipping tests show that some of the standard dips, at the proper strength, are very destructive to it. It is said that considerable progress has been made in the study of the goat louse.

Twenty-sixth report of the State entomologist of Connecticut, 1926, W. E. BRITTON (*Connecticut State Sta. Bul. 285 (1927), pp. 157–283 pls. 16, figs. 11*).—The first part of this report (E. S. R., 55, p. 251) deals with the entomological features of the year (pp. 166–181); inspection of nurseries and of imported nursery stock, by Britton and M. P. Zappe (pp. 181–191); inspection of apiaries (pp. 192–198); and gypsy moth work in the State, by Britton and J. T. Ashworth (pp. 199–222).

An account of The Spruce Gall Aphid (*Adelges abietis L.*) and Its Control is given by R. B. Friend (pp. 223–228). In the control of this insect it is

recommended that the trees be sprayed while dormant with miscible oil 1:25, whale-oil soap 1 lb. to 8 gal. of water, nicotine sulfate 1:500 plus soap, or commercial lime sulfur 1:40.

In Further Reports on Spraying and Dusting of Apples, by E. M. Stoddard and Zappe (pp. 228–234), a comparison is made of the relative value of different treatments. It is concluded that spraying is necessary, in the early treatments at least, to insure a high percentage of perfect fruit.

Work with the Oriental Peach Moth in 1926 is reported upon by P. Garman (pp. 234–239). The records obtained from the use of bait pans indicate three distinct periods of maximum abundance or broods and correspond with insectary and orchard cage findings. The bait pans show that moths are present in the orchard until the latter part of September. Large numbers of the moths were caught daily in the bait pans, but due apparently to the great moth population in the orchard, no control advantage was gained from their use. Referring to control studies, it is stated that there was from 10 to 20 per cent less wormy fruit than during the preceding year. It is thought that cultivation and parasitism were important contributing factors, to which was added the rainy period during the time the third brood was at its height. The parasite *Trichogramma minuta* Riley was reared from the eggs at New Haven. In observations of the feeding habits of the moth on artificial food it was found that while they did not develop naturally on any of the foods, in several cases they passed through complete instars and survived for as long as 3 weeks on the artificial media.

An account of the European Corn Borer Clean-up Work in 1926 is given by Britton and Zappe (pp. 239–243). The Japanese beetle in Connecticut, which was first discovered at Stamford on September 1, is discussed (pp. 244–252), as is also A Co-operative Project in Controlling the Asiatic Beetle, *Anomala orientalis* Waterh. (pp. 252–257). A Report of Quarantine and Control Work for the Asiatic Beetle during 1926 is given by J. P. Johnson (pp. 257–264). An account is given (pp. 264–267) of The Satin Moth in Connecticut, which was discovered during the early fall in the towns of Thompson and Stonington. An extended account of this pest by Burgess and Crossman is noted on page 164. B. H. Walden presents a note on the Abundance of *Ormenis pruinosa* Say on Ibota Privet (pp. 267, 268), hedges of which in Bridgeport were heavily infested. Mosquito control work is discussed by R. C. Botsford (pp. 268–275), and the report concludes with Miscellaneous Insect Notes (pp. 276–279).

[Work in entomology by the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 49–64, figs. 6*).—The major part of this report deals with the occurrence of and work during the year with the European corn borer. In discussing the handling of the corn crop and residue, studies are reported which show that the longer the corn is allowed to stand after it matures the lower down the borers work their way and the greater the number left in the stubble, emphasizing the importance of cutting the corn as early as possible. Shredding the fodder is said to destroy 95 per cent of the borers that pass through the shredder. Cutting infested stalks into short lengths of 1 in. or less destroys practically all borers. In regard to date of planting the data indicate that corn planted from May 10 to June 1 is likely to carry a rather heavy infestation as compared with corn planted later. Experiments conducted indicate that moths live longer and deposit more eggs under conditions of high humidity than low humidity. Other phases briefly considered include variety tolerance, yield records, rate of planting, fertilizer tests, corn breeding, areas of infestation, and physiological and morphological studies.

In control work with leafhoppers infesting apple, oil sprays and some of the combinations in which oil was used reduced the hatching as much as 50 per cent. Other insects briefly reported upon include apple aphids; the codling moth; the potato-scab gnat (*Pnyxia scabiei*), an important pest of the potato crop; the bean aphid, an outbreak of which occurred in four counties; the European red mite; red spiders on conifers; and climbing cutworms.

[Report of work in entomology at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 28–33*).—In aphid studies during the year 54 complete generations of the melon aphid were reared, including a total of 748 aphids. Of this number 3 per cent were winged forms, which occurred in only 6 of the 54 generations, and in each instance crowding had taken place. Isolations were made from 8 different generations, and the individuals developing in each isolation were allowed to become crowded. In every case winged forms appeared whether the temperature was high or low, as long as it was sufficiently high to permit reproduction. In 51 generations the progeny were not permitted to become crowded and all were wingless, while in 3 generations crowding occurred and winged forms appeared.

Studies on the ingestion of poison by the cotton boll weevil show that the greater part of the poison that kills the weevils is picked up when traveling over the plants rather than from ingesting it while actually feeding. In boll weevil control work during the season of 1925, 6,000 acres of cotton in the State were dusted commercially by means of airplanes with effective results.

Mention is made of the life history of the cotton hopper (*Psallus seriatus*) and its control, reports of which, by Reinhard, have been noted (E. S. R., 55, p. 458). Reference is also made to the work with sulfur and sulfur compounds.

In control work with ants on citrus fruits, calcium cyanide dusts proved fairly effective but are not entirely satisfactory.

In foulbrood work 1 per cent of the 24,744 colonies inspected were found to be infected.

The progress of beekeeping investigations is reported upon and reference made to Circular 35, on queen rearing, issued during the year (E. S. R., 53, p. 456). The weights of colonies studied in connection with weather data show that bees do not work in the field after the temperature has reached 94° F. with the humidity below 60. The amount of honey used by a normal colony in the vicinity of the apiculture laboratory in southern Texas from November to February was 8 lbs. It was determined that under the conditions obtaining in that vicinity the queen that had not oviposited by noon on the eleventh day after emergence probably would never do so. The work with honey plants indicated that with a proper distribution of native Monarda or horsemint seed a honey flow of double the present length could be obtained. Line-breeding work, accompanied by the test of individuals, has shown a marked increase in honey production over the record of the queen used as the race mother.

The pests of agriculture observed in the districts of Lublin and of Kielce in 1924 [trans. title], J. Woroniecka (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 5 (1924), A, pp. 379–392; Eng. abs., pp. 391, 392*).—A brief account of the more important pests in these districts of Poland in 1924.

[Economic insects in India] (*India Dept. Agr. Mem., Ent. Ser., 9 (1926), Nos. 7–9, pp. 241–260, pl. 1*).—Three papers are here presented, as follows: New Species of Indian Gall Midges (Itonididae), by E. P. Felt (pp. 241–245); New Indian Geometridae, by L. B. Prout (pp. 247–257); and Description of *Laspeyresia stirpicola* n. sp. (Lepidoptera), by E. Meyrick, with a short note on the Life History and Status, by C. S. Misra (pp. 259, 260).

Habits and control of termites, A. E. MILLER (*Ill. Nat. Hist. Survey, Ent. Ser. Circ. 10 (1926), pp. 8, figs. 6*).—A brief practical account.

The life of termites, M. MAETERLINCK (*La Vie des Termites. Paris: Eugène Fasquelle, 1927, pp. 217, fig. 1*).—This is a popular account.

Gryllus domesticus Linn. as a household pest in Rochester, N. Y. (Orthoptera: Gryllidae), J. D. HOOD (*Ent. Soc. Wash. Proc., 29 (1927), No. 1, pp. 22, 23*).—A brief note upon the appearance of the common field cricket in New York State and a list of 22 States in which it is known to occur.

Studies on Indian Thysanoptera, H. H. KARNY (*India Dept. Agr. Mem., Ent. Ser., 9 (1926), No. 6, pp. 187–239, pls. 8, figs. 28*).—This paper reports on a collection of Thysanoptera from south India, representing 50 different species, 18 of which are new to science, and 4 represent new genera.

The apple sucker (Psylla mali Schmidberger).—I, The morphology and the coloring [trans. title], S. MINKIEWICZ (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 5 (1924), A, pp. 250–272, pls. 2; Eng. abs., pp. 267–270*).—This account deals with the synonymy, morphology, construction of the ovipositor, and coloring of the apple sucker.

The cotton flea hopper, C. O. EDDY (*South Carolina Sta. Bul. 235 (1927), pp. 21, figs. 11*).—A summary of information on this pest is given in connection with a report of experiments and observations made in South Carolina during 1926. Recent accounts of this pest by Hunter (E. S. R., 55, p. 660) and Reinhard (E. S. R., 55, p. 458) have been noted. Injury by this insect was noted for the first time in the State in 1924, when cotton plants in nearly the entire State were damaged. In 1925 very little damage occurred and that in the Piedmont section only, while in 1926 it was found in all parts of the State, the principal injury taking place in the Piedmont section where it caused more damage than at any previous time.

Two currant aphids that migrate to willow-herbs, E. M. PATCH (*Maine Sta. Bul. 336 (1927), pp. 8, pl. 1, fig. 1*).—An account is first given of the variable currant aphid (*Aphis varians* Patch), which is one of the most abundant and destructive aphids common on the currant, its infestation causing dwarfed bushes and preventing the proper setting of the fruit. It is not confined to cultivated currants, the author having found its spring colonies on five species of currants and gooseberries in Maine. The egg overwinters on a currant or gooseberry bush. By June the aphids of the third generation are found bunched so thickly along the new shoots that there is hardly room for them to feed upon the stalks. When the spring migrants leave the currant or gooseberry bushes they are attracted to the willow-herbs (Epilobium) where they establish summer colonies, as was determined by the author in 1921. The life cycle of this aphid is graphically illustrated in chart form.

The green gooseberry aphid (*Aphis sanborni* Patch), which is common on wild gooseberry bushes and occurs on cultivated gooseberry and currant, is a small species of aphid whose colonies distort the spring foliage. The seasonal history is similar to that of the variable currant aphid, as its spring migrants seek willow-herbs in early summer and the fall migrants return to the primary food plant late in the season. Experimental evidence of the migration of this aphid between Ribes and Epilobium was obtained by the author in 1921.

As a control measure the application of nicotine sulfate in water in the spring should kill the aphids before the damage becomes excessive.

The pea aphid in Maine, E. M. PATCH (*Maine Sta. Bul. 337 (1927), pp. 9–20, fig. 1*).—In this account of the pea aphid, which first appeared in excessive

numbers in Maine in 1899, the author considers the seasonal history, recognition marks, Maine food plants, its rôle as a carrier of plant disease, natural controls, and remedial and preventive measures. It is pointed out that where the winters are as severe as in Maine, the pea aphid overwinters only in the egg stage, the eggs being deposited on red clover.

Control of the San Jose scale, G. A. Dean and H. B. Hungerford (*Kans. Ent. Comn. Circ. 8 (1926), pp. 8, figs. 3*).—A practical discussion of San Jose scale and its control as applied to Kansas conditions.

Contribution to the knowledge of the Coccidae of Egypt, W. J. Hall (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 72 (1926), pp. [3]+41, pls. 13*).—Part 1 (pp. 1–28) of this contribution consists of records of Coccidae new to Egypt with descriptions of new species, 14 of the 20 forms here described being new to science. Part 2 (pp. 29–34) consists of notes on species recorded in earlier bulletins. Part 3 (pp. 35–38) gives a list of the Coccidae of Egypt (123 species) up to date, arranged in tabular form. Part 4 (pp. 39–41) gives a list of host plants additional to those contained in the bulletins previously noted (E. S. R., 54, p. 755).

A contribution to the study of a biological complex: The cabbage worm (Pieris brassicae L.) and its hymenopterous parasites, J. C. Faure (*Contribution a l'Étude d'un Complexe Biologique: La Piéride du Chou (Pieris brassicae L.) et Ses Parasites Hyménoptères. Lyon: Bosc Bros. & Riou, 1926, pp. 221, pls. 8, figs. 3*).—The first 5 parts of this work deal with a study of the biology of the cabbage worm (*P. brassicae*) (pp. 15–27), the primary parasites of this worm (pp. 29–101), the secondary parasites (pp. 103–172), general considerations of the biology of the hymenopterous parasites (pp. 173–196), and a study of the cabbage worm and parasite complex (pp. 197–203). The sixth part consists of a résumé and general conclusions (pp. 205–209).

A bibliography of 11 pages is included.

The satin moth, a recently introduced pest, A. F. Burgess and S. S. Crossman (*U. S. Dept. Agr. Bul. 1469 (1927), pp. 23, pl. 1, figs. 5*).—In this summary of information on the satin moth, an earlier account of which has been noted (E. S. R., 45, p. 153), the present status of knowledge of the pest is presented. In the New England States the moth has continued to spread, now occurring over an area along the Atlantic coast about 60 miles wide and extending from the city of Belfast, Me., to Stonington, Conn. In Washington, where it was first discovered at Bellingham in 1922, 2 years after its discovery in British Columbia, it now infests the entire western third of the State. The subject is presented under the headings of distribution in Europe and Asia, North American distribution, description and habits, food plants, artificial control, natural enemies, economic importance, and quarantine.

Combating the potato-tuber moth in storage [trans. title], P. van der Goot (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Korte Meded. Inst. Plantenziekten, No. 1 (1926), pp. 17; Eng. abs., pp. 16, 17*).—A discussion of this pest and means of control as applied to conditions in Java.

A progress report on the investigations of the European corn borer, D. J. Caffrey and L. H. Worthley (*U. S. Dept. Agr. Bul. 1476 (1927), pp. 155, figs. 53*).—This is a summary of the present status of knowledge of the life history and bionomics of the European corn borer based upon (1) a review of the literature in connection with a list of 72 references, (2) investigations contributed to by some 20 agents of the Bureau of Entomology from 1918 to 1924, and (3) information received from collaborators. The investigations reported are based upon work conducted at laboratories located at Arlington, Mass.; Silver Creek, Schenectady, and Scotia, N. Y.; Sandusky, Ohio; and Hyères, Var,

France. The data are presented under the headings of inception and scope of the work, systematic history and synonymy, distribution, probable manner of importation, host plants, character of injury, extent of injury and economic loss, description, seasonal history, life history, larval habits, pupation, adult habits, dispersion, natural enemies, disease, and control and quarantine. In the supplement (pp. 147–154) are summarized a few of the more important developments which have occurred since the manuscript was prepared. In it the authors consider the distribution, host plants, extent of injury and economic loss, seasonal history, larval habits, adult habits, parasites, and control.

Spread and infestation by the European corn borer during 1926, L. H. WORTHLEY and D. J. CAFFREY (*U. S. Dept. Agr., Misc. Circ. 104 (1927), pp. 12, figs. 2*).—It is pointed out that during 1926 there was not only a great extension of the territory occupied by the European corn borer in the Great Lakes region, but that there was also an alarming increase in the severity of infestation and damage as compared with the preceding year. In the New England, or two-generation area, there was a decrease in the numbers. The circular gives information on the situation for corn growers and recommendations for control procedure in the spring work.

[The European corn borer] (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 128–153, figs. 8*).—The papers here presented include 2 contributions from the Ohio Experiment Station: Entomological Research on the European Corn Borer in Ohio, by L. L. Huber and C. R. Neiswander (pp. 128–137), and Agronomic Research on the European Corn Borer in Ohio, by R. M. Salter and L. E. Thatcher (pp. 137–153).

The European corn borer, J. J. DAVIS (*Indiana Sta. Circ. 138 (1926), pp. 18, figs. 10*).—This is a practical résumé of information on the European corn borer, which was established in six northeastern counties of Indiana in 1926, and on the means for its control.

The control of armyworms and cutworms, C. J. DRAKE and H. M. HARRIS (*Iowa Sta. Circ. 101 (1927), pp. 8, figs. 6*).—A practical summary of control measures.

The codling moth in Massachusetts, A. I. BOURNE and W. D. WHITCOMB (*Massachusetts Sta. Bul. 233 (1927), pp. 53–72, pls. 2, figs. 2*).—This is a report of investigations conducted over a period of three consecutive seasons with a view to discovering means for the prevention of side worm injury, a preliminary account of which, by Bourne, has been noted (E. S. R., 55, p. 256).

In Massachusetts, where the pest has one complete generation and a partial second annually, pupation begins the last of April or early in May, about the time the apple buds show pink. The moths appear by the middle or last of May, and emergence continues for 5 or 6 weeks. Four or 5 days after they emerge the females begin to oviposit, although, if the weather is cold or stormy, they may delay longer before doing so. The incubation period of the eggs varies from 4 to 12 days, with 6 to 7 as the average, so that young larvae begin to appear about 2 weeks after the emergence of the moths. Most of the larvae that mature before July 15 transform to moths the same season. Therefore, the relative number of larvae leaving the fruit before that time in any year determines the size and importance of the second generation that season. The greater part of the summer brood moths emerge during the last week of July and the first 10 days of August, and most of the larvae, or "worms," of this brood appear from August 10 to 20. These larvae remain in the fruit for 3 to 6 weeks, emerging in largest numbers during September and early October. There has been found to be a slight overlapping of the two generations, so that from the time fruit is set until harvest there are but few days when infestation may not take place.

In control work, spraying has been found more effective than dusting, the calyx and postcalyx sprays being the most important.

A brief discussion of the choice of fungicides, by W. L. Doran, is included (pp. 70, 71).

Codling-moth control in Wellington apricot orchards, F. W. Petty (*Farming in So. Africa, 1 (1926), No. 4, pp. 134, 135*).—The author points out that the codling moth continues to be a serious pest to apricots in many Wellington orchards, where practically no pear, apple, or quince orchards exist; and that it appears to be slowly spreading to most orchards in the district. At the time of writing it was being reared from loquats.

Paris green applied by airplane in the control of Anopheles production, L. L. Williams, jr., and S. S. Cook (*Pub. Health Rpts. [U. S.], 42 (1927), No. 7, pp. 459–480, pls. 2, figs. 2*).—This is an account of mosquito control work conducted at the marine barracks at Quantico, Va. The use of drainage and oil within the post only was attempted from 1917 up to the close of 1925. These measures reduced the mosquito infestation appreciably, but did not control malaria convection on the post. During these years the mosquito was present in excessive numbers from the middle of summer until fall. The late summer mosquito was largely *A. quadrimaculatus* produced among the flotage composed of heavy mats of dead and dying eelgrass and spear-leaved water lilies.

During 1926 the production of Anopheles mosquitoes was controlled by the use of Paris green applied from an airplane, the dusting being effective in all types of vegetation from open marsh to densely wooded swamp, but it did not affect mosquitoes of other genera. The work showed 1 lb. of Paris green per acre to be effective. Hydrated lime and powdered soapstone were used as diluents, and each was satisfactory. With wind velocities of less than 4 miles per hour and flying heights 100 ft. or less, a 25 per cent Paris green mixture was effective. In winds of greater velocity and with flying heights of over 100 ft. a dilution of 50 per cent was effective. The slides effectively revealed the distribution and concentration of Paris green. The pans of larvae, although useful, did not give conclusive evidence of the mortality rate. Larvae dipping in natural breeding areas is considered the most valuable method of determining the minimum lethal dose. When breeding was continuous and heavy it was necessary to dust at weekly intervals. The cost of material was 72.4 cts. per acre.

Reference is made to the dusting work with Paris green by King and Bradley previously noted (E. S. R., 55, p. 156).

Studies of an epidemic of malaria at the Gantt impounded area, Covington County, Alabama, W. G. Smillie (*Amer. Jour. Hyg., 7 (1927), No. 1, pp. 40–72, figs 17*).—The author's studies during the epidemic of malaria at Gantt, Ala., show that *Anopheles quadrimaculatus* is essentially a pond breeder, its breeding season being from June to October and its flight range approximately 1 mile. *A. crucians* was found to be most prevalent during the early spring and summer, while *A. punctipennis* was found throughout the year but was most prevalent during the winter months.

Mosquito and malaria control in Illinois, H. F. Ferguson (*Ill. State Acad. Sci. Trans., 17 (1924), pp. 279–293, pls. 3, figs. 3*).—A discussion of the work conducted in Illinois by the chief sanitary engineer of the State Department of Public Health.

Exterminating the warble fly in Denmark, H. Faber (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 10, pp. 905–907*).—This is an account by the agricultural commissioner to the Danish Government in which he records results which are considered to show that the total extermination of the warble fly can be

accomplished within a few years by compulsory destruction. It is stated that a law has just been passed in Denmark (in 1926) to remain in force until the close of the year 1930, which is similar to the law passed in 1923 under which the work has been conducted. By continuing the work along the same lines it is hoped the warble pest will be exterminated in Denmark by the end of 1930.

Fruit fly (Ceratitis capitata): Trapping or luring experiments, L. J. Newman (*Jour. Dept. Agr. West. Aust., 2. ser., 3 (1926), No. 4, pp. 513–515, fig. 1*).—This is a report of an experiment conducted for the purpose of further demonstrating the fact of the overwintering of the female fruit fly, and to prove the effectiveness of trapping in winter and spring.

Chemotropic tests with the screw-worm fly, D. C. Parman, F. C. Bishopp, E. W. Laake, F. C. Cook, and R. C. Roark (*U. S. Dept. Agr. Bul. 1472 (1927), pp. 32*).—The investigations here reported were conducted with a view to discovering a material that will prevent reinfestation for 48 hours or longer. In testing the chemotropic responses of the screw-worm fly, jars containing various chemicals, etc., on fresh meat were exposed in a favorable environment where flies were plentiful in Dallas and in Uvalde, Tex. The repellent or attractant action of 353 compounds and mixtures was tested and is reported upon in detail in tabular form.

Of all the materials tested as repellents, certain products obtained from the pine were among the best. These include pine oil, both the destructively and steam distilled; crude turpentine; pine tar; and pine-tar oil. In view of the cheapness, availability, nontoxicity, and adhesiveness of pine-tar oil, the authors are of the opinion that it is the best material among all those tested to use upon wounds of domestic animals to protect them against infestation. The results presented will serve as a basis for tests upon living animals which are now under way.

The Colorado potato beetle (Leptinotarsa decemlineata Say) in Canada, A. Gibson, R. P. Gorham, H. F. Hudson, and J. A. Flock (*Canada Dept. Agr. Bul. 52, n. ser. (1925), pp. 30, figs. 2*).—This is a report of studies commenced in 1919 and conducted through 1922. It deals with the spread of this beetle in Canada, its life history and bionomics; gives technical descriptions of the several stages, and considers its natural and artificial control.

The Mexican bean beetle, C. O. Eddy and L. C. McAlister, jr. (*South Carolina Sta. Bul. 236 (1927), pp. 38, figs. 18*).—In this account the authors report particularly upon studies made of the life history of the Mexican bean beetle. The data are presented in tabular and chart form. An earlier account by one of the authors (E. S. R., 55, p. 357) and reports of studies by Howard (E. S. R., 48, p. 57), Thomas (E. S. R., 50, p. 758), Merrill (E. S. R., 37, p. 465), and others have been noted.

The strawberry crown borer, L. Haseman and K. C. Sullivan (*Missouri Sta. Bul. 246 (1927), pp. 8, figs. 4*).—A practical summary of information on this insect and means for its control.

Wintering bees in Canada, C. B. Gooderham (*Canada Dept. Agr. Bul. 74, n. ser. (1926), pp. 31, pls. 4, figs. 20*).—A practical summary of information on the care of bees during the winter.

Rearing of the queen bee, V. Asprea (*L'Allevamento delle Api Regine. Milan: Ulrico Hoepli, 1926, pp. XV+274, figs. 42*).—This is a practical account.

Observations on the biology of Aphidius cardui Marsh [trans. title], C. Gautier, S. Bonnamour, and L. Gaumont (*Bul. Soc. Ent. France, No. 13–14 (1926), pp. 148, 149*).—The authors record the rearing of this braconid parasite from a number of aphids, including *Alphis grossulariae* Kalt.

New coccid-inhabiting parasites (Encyrtidae, Hymenoptera) from Japan and California, H. Compere (*Calif. Univ. Pubs. Ent., 4 (1926), No. 2, pp. 33–50, figs. 9*).—Following the introduction, a key is given to the females of Japanese Microterys and a description of 2 new species from Japan; a key to the females of California Microterys and a description of Microterys species from the State, including 3 new forms; a key to the 4 described species of Comperiella; and a description of *C. unifasciata* Ishii.

The establishment in California of Coccophagus modestus Silv. (Aphelinidae, Hymenoptera), with notes on its life history, H. S. Smith and H. Compere (*Calif. Univ. Pubs. Ent., 4 (1926), No. 3, pp. 51–61, figs. 2*).—This is an account of the introduction from South Africa and life history of an important parasite of the black scale in California, the establishment of which following several failures was successfully accomplished in 1924. It is pointed out that the black scale is the most important insect enemy of citrus and the only serious pest of the olive, severely infests many of the deciduous fruit trees and a great many of the ornamentals, and has been the subject of more attempts at biological control than any other pest in the State.

Microgaster sticticus Ruthe [Hym. Braconidae] a parasite of Oenophtira pilleriana Schiff. and of Tachyptilia populella Cl. in Hautes-Alps [trans. title], C. Gautier and H. Cleu (*Bul. Soc. Ent. France, No. 2 (1926), pp. 21, 22*).—The authors give a description of both sexes of this parasite.

ANIMAL PRODUCTION

The stockfeeder's companion, J. Porter (*London: Gurney & Jackson, 1927, 2. ed., rev. and enl., pp. XXIII+364, pls. 44, figs. 4*).—This is the second edition, revised and enlarged, of the book previously noted (E. S. R., 33, p. 664).

Effect of fertilizers on vitamin-B content of wheat (*Ohio Sta. Bul. 402 (1927), p. 93*).—In feeding wheat to rats it was found that climate and other unknown factors may affect the vitamin B content. Tests have shown that a ration must contain from 60 to 70 per cent of wheat as the only source of vitamin B if reproduction and growth of young are to be normal.

The losses in the tower silo, H. E. Woodman and A. Amos (*Jour. Agr. Sci. [England], 16 (1926), No. 4, pp. 539–550*).—A wooden tower silo with a drain for carrying off the expressed juices was used in this experiment. In the 1924 season the ensiled crops consisted of oats, tares, and beans. Eight loosely woven jute bags, containing weighed amounts of crop of known moisture content, were buried at different heights as the silo was filled. The filling was done during the period from July 10 to 14. On October 7 the top layer of spoiled material was removed, and a layer of chaffed green maize filled in, in which two sample bags were put. The first bags were removed January 7, 1925, and other bags at intervals up to the middle of June. Two bags still remained in the silo when it was again filled in June, 1925, with alternate loads of alfalfa and a mixed crop of oats, tares, beans, and peas. Bags were buried at regular intervals at this filling and removed as the silage was used, the last being reached on June 29, 1926. The contents of the bags were weighed, and samples were analyzed as previously described (E. S. R., 55, p. 463).

The results of this experiment show that the temperature attained has little significance in the destruction of carbohydrates in the making of "sweet" silage. "Acid brown" silage can be made from green crops containing 26.5 to 33.9 per cent of dry matter, with an average loss of 5 to 6 per cent of this dry matter. With "green fruity" silage the loss is 8 to 9 per cent of dry matter. When the crops that go in the silo are uniform in moisture content the lowest loss of dry matter occurs in the middle layer. Excessive losses may occur when

the silo is filled with very sappy or rain-laden crops. Green corn may be ensiled with a loss of dry matter of 13 to 14 per cent. A period of two weeks appears to be sufficient for a green crop to acquire the essential characters of silage.

Nutrients required for growth production with Indian food-stuffs, F. J. Warth and I. Ahmad (*India Dept. Agr. Mem., Chem. Ser., 8 (1926), No. 11, pp. 211–233*).—A continuation of work previously noted (E. S. R., 55, p. 67).

Two groups of heifers, averaging 255 and 439 days of age at the beginning of the experiment, were fed for a period of 116 days. The younger lot received a daily ration of 2 lbs. of a mixture consisting of 7 parts of bran, 3 parts of cottonseed meal, and 5 parts of gram (chick-pea) husks, 1 lb. of peanut cake, 6 lbs. of silage, and all the hay they would eat. The older lot received 3 lbs. of the mixture, 1 lb. of cake, 10 lbs. of silage, and all the hay they would eat. Records were kept of the live weight increase, and a digestion trial of 10 days' duration was run to test the digestibility of these feeds.

On the whole the older group had a higher average digestive capacity than the younger group. This is partly accounted for by a higher consumption per 1,000 lbs. of live weight and a higher proportion of hay consumed by the younger group. The computed requirements per pound of gain were 1.907 and 2.696 therms for the younger and older groups, respectively. The requirements under the conditions of this test are higher than the Armsby standard. Compared with the Wolff Lehmann standard the protein requirement was the same, but smaller amounts of total nutrients were used.

The food capacity of cattle, J. A. Murray (*Jour. Agr. Sci. [England], 16 (1926), No. 4, pp. 574–583, figs. 3*).—An analysis of the data from a number of experiments showed that the food capacity (for total dry matter) of steers is subject to a nearly uniform acceleration of 40 lbs. per month from birth to from 12 to 14 months of age. From this time on, the capacity is nearly constant. In the case of steers the average constant rate of consumption is about 18 lbs. of total dry matter per head per day from 1 to 4 years of age and in the case of milking cows about twice that much.

Roughages for fattening steers (*Texas Sta. Rpt. 1926, pp. 24, 25*).—In cooperative tests with fattening steers it was shown that the cost of 100 lbs. of gain in lots receiving sumac silage, suplemented with ground milo heads and cottonseed meal, and lots receiving sumac fodder was approximately the same. The gains were also practically identical. Cattle receiving cottonseed hulls made smaller gains at a cost of approximately $1 per hundredweight more than the above lots.

Age as a factor in profitable steer feeding, J. P. Sackville and J. E. Bowstead (*Alberta Univ., Col. Agr. Bul. 12 (1925), pp. 28, figs. 8*).—The results of three years' work with fattening cattle of different ages are reported. These experiments were begun in 1922–23 and carried on for the two subsequent winters. Calves, yearlings, and 2-year-old steers were fed the same rations under identical conditions. The ration consisted of oat silage and prairie hay, with a grain mixture of ground barley 2 parts, ground oats 1 part, and an average of about 1 lb. of linseed-oil meal per head daily. Silage and hay were full fed from the start, and the grain was gradually increased until animals were on full feed.

The average of the three years' work shows that the calves gained 1.78 lbs. per head daily, the yearlings 2.18 lbs., and the 2-year-olds 2.31 lbs. The average daily feed consumption was greatest in the 2-year-old lot and least in the lot of calves. The older the steers the less time was required to put them in marketable condition. Yearlings required about 5 weeks and calves 10 weeks longer to reach the same degree of finish than the 2-year-olds. The

younger cattle required less feed per unit of gain than the older cattle. The conclusions reached by the authors are that the cost of feeds and feeders should influence the producer as to the age of cattle to feed.

The Bhagnari breed of cattle in Sind and Baluchistan, H. G. BALUCH (*Bombay Dept. Agr. Bul. 126 (1925), pp. 16, pls. 6*).—This is a description of the Bhagnari breed of cattle, which are highly prized in India as draft animals. The methods of breeding, feeding, and management, together with illustrations of the best types, are included.

Market classes and grades of cattle, D. J. SLATER (*U. S. Dept. Agr. Bul. 1464 (1927), pp. 88, figs. 37*).—A new classification of the market classes and grades of cattle supersedes the one previously noted (E. S. R., 14, p. 597). The basis of classification and terms used in designating the classes are defined. All the various classes and grades of slaughter cattle and stocker and feeder cattle are described and illustrated. Charts for scoring both slaughter cattle and stocker and feeder cattle are included.

Market classes and grades of dressed lamb and mutton, W. C. DAVIS and J. A. BURGESS (*U. S. Dept. Agr. Bul. 1470 (1927), pp. 48, figs. 18*).—A classification for the market grades and classes of dressed lamb and mutton. Lamb and mutton are defined, as also are the terms conformation, finish, and quality. The style of dressing and basis of grading, the grades of lamb and mutton carcasses, and the standard wholesale cuts are described. A table gives the approximate percentage of total weight of choice grade lamb carcasses represented by each wholesale cut under different methods of cutting.

[Experiments with sheep at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 22, 26, 27*).—Results of three experiments are noted.

Relation of skin folds to weight of fleece in Rambouillet sheep.—In general it has been found that the fleece of B type Rambouillets have a tendency to be shorter in length than fleeces of C type. The record of individual scouring tests for two years has shown that C type sheep produce more scoured pounds of wool than do B type individuals. The latter, however, produce the heavier unscoured fleeces.

A study of the adaptation of the Corriedale sheep to southwest Texas conditions.—In continuing this cooperative study (E. S. R., 49, p. 467) it was found that the Corriedale ewes produced 4.02 lbs. of scoured wool, which shrank 44 per cent, as compared to 3.55 lbs. by the Rambouillet ewes, with a shrinkage of 57 per cent. The lambing percentage for the Corriedale ewes was 83 per cent, the 20 ram lambs averaging 9.3 lbs. at birth, as compared to a 61 per cent lamb crop for the Rambouillets, the 80 ram lambs from which averaged 10 lbs. at birth. The aged Corriedale ewes averaged 98 lbs. in weight after shearing and the aged Rambouillet ewes 104 lbs.

Shearing sheep once v. twice a year.—In 1925–26 the aged ewes sheared twice during the year yielded 1 lb. more grease wool than those sheared once a year. In the yearling group the ewes sheared twice a year produced 0.75 lb. more grease wool than those sheared once during the year (E. S. R., 55, p. 360).

Range wool production in New Mexico, M. G. SNELL (*N. Mex. Agr. Col. Ext. Circ. 86 (1925), pp. 36, figs. 18*).—The problems in producing wool of good quality are discussed. The wool from different types of sheep is described, and a detailed list of wool grades (E. S. R., 33, p. 270), with illustrations, is included. The selection of sheep and the care and culling of those selected to maintain the quality are discussed, and the general problems of management, such as feeding, shearing, sacking, and the marketing of the wool crop, are considered.

[Lamb feeding investigations at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 86, 88*).—The results of experiments are noted.

Fattening lambs in the cornfield.—In continuation of work previously noted (E. S. R., 53, p. 574), 23 lambs fed standing corn alone made an average daily gain per head of 0.147 lb. and cost $14.74 for each 100 lbs. of gain. The addition of 0.21 lb. of linseed oil cake, 1 lb. of clover hay, or 0.14 lb. of linseed oil cake and 0.88 lb. of clover hay daily increased the average daily gain to 0.286, 0.322, and 0.353 lb. per head, respectively. Dwarf Essex rape decreased the feed required per unit of gain and also increased the returns per acre.

Ram lambs and other lambs as feeders.—A group of thin ram lambs and a similar group of ram lambs castrated at the start of the feeding period were compared with a lot of ewe and wether lambs. The ram lambs made the largest average daily gain with the least cost per 100 lbs. of gain. Due to being severely penalized by packer buyers, they were the least profitable group. The lot of ewe and wether lambs made a return per lamb over feed cost of $1.53 greater than the ram lambs and $1.31 greater than ram lambs castrated at the beginning of the feeding period.

Native lambs v. western lambs as feeders.—Native mutton × fine wool crossbred lambs treated for stomach worms made slightly smaller gains but at a cheaper cost than black-faced western lambs. Native lambs cost less at the feed lot than western lambs. The return per lamb over feed cost was $2.28 in the case of native lambs and 84 cts. in the case of western lambs.

[**Swine feeding investigations at the Ohio Station**] (*Ohio Sta. Bul. 402 (1927), pp. 81, 83–85*).—The results of several feeding tests are noted.

Soy beans for pigs of different ages.—Ground soy beans returned a calculated profit of $1.25 per bushel when fed to 130-lb. pigs on pasture, $1.08 per bushel for weanling pigs on pasture, and $1.06 per bushel for 130-lb. pigs not getting forage. The 130-lb. pigs receiving soy beans and those receiving tankage on pasture gained an average of 1.71 and 1.73 lbs. per head daily. Similar pigs in dry lot gained 1.42 and 1.72 lbs. per head daily. Fifty-lb pigs receiving soy beans on pasture gained 0.92 lb. and those receiving tankage 1.2 lbs. per head daily.

Increasing the effectiveness of corn and tankage for pigs.—In continuation of work previously noted (E. S. R., 53, p. 470), the results in a fourth experiment showed that the addition of 1.5 per cent of limestone to a corn and tankage winter ration failed to improve it. A summary of the three previous trials showed that the addition of limestone increased the rate of gain 17.4 per cent and lowered the feed cost 12 cts. for each 100 lbs. of gain. Skim milk proved more efficacious when it replaced part of the tankage than when used as the sole supplement.

Cod-liver oil, even when treated in such a manner as to destroy the vitamin A content and fed with yellow corn and tankage at the rate of 0.5 lb. for each 100 lbs. of feed, increased the rate of growth and also decreased the amount of feed required to produce that growth. A mixture of tankage, linseed oil meal, and alfalfa meal, 2 : 1 : 1, made an excellent protein supplement, and pigs fed such a ration gained more rapidly than those fed tankage or tankage and limestone. The addition of limestone to this mixture did not reduce the cost but did increase the rate of gain. Pigs having access to direct sunlight made more rapid and economical gains than those confined indoors. Neither commercial nor home-grown yeast made a sufficient increase in the rate or economy of gain to pay for the additional expense.

Minerals for swine.—A simple mineral mixture of salt, limestone, and raw bone meal, 1 : 2 : 2, was fed with a ration of corn and soy bean oil meal. Other minerals were added to this mixture to find their effect. Glauber's salts fed at the rate of 10 lbs. to each 100 lbs. of mixture did not increase the rate of

gain but did save slightly on the feed required for 100 lbs. of gain. Wood charcoal, 15 per cent, had no apparent effect upon the rate or economy of gains. Potassium iodide in an amount of 0.05 lb. for each 100 lbs. of mixture proved beneficial. Pigs fed copperas at the rate of 2 lbs. for 100 lbs. of mixture gained 0.2 lb. more per head per day and ate 52.5 lbs. less feed for 100 lbs. of gain than those fed no copperas.

Carriers of phosphorus for swine.—Acid phosphate proved less valuable than raw bone meal as a source of phosphorus, both in dry lot and on pasture when fed with a ration of corn, soy bean oil meal, salt, and limestone. Spent bone black, raw bone meal, and special steamed bone meal when compared as ingredients for mineral mixtures showed little difference in worth for swine.

[Swine feeding investigations at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 54–57*).—The results of two experiments are noted.

Cottonseed meal for maintaining, growing, and fattening hogs.—In continuation of this study (E. S. R., 55, p. 362), 12 pigs from the September, 1925, farrow were placed in dry lot at a weight of 89.8 lbs. and fed for 70 days on the following ration: Ground milo 75 parts, gray wheat shorts 10 parts, prime cottonseed meal 15 parts, and 2 parts of a mineral mixture composed of 75 per cent of bone meal and 25 per cent of salt. While on tests these pigs made an average daily gain of 1.32 lbs. per head and required 377.8 lbs. of feed per 100 lbs. of gain.

The studies have indicated that sows produce as large and healthy litters when cottonseed meal is used as a protein supplement as when an animal protein is used. Pigs on a properly balanced diet have made good and economical gains when fed cottonseed meal. When fed with milo it has been found beneficial to supplement cottonseed meal with minerals.

Effect of adding various minerals to a fattening ration for hogs.—Adding minerals to a ration composed of ground milo 85 per cent and a protein supplement 15 per cent (E. S. R., 55, p. 362) was continued, using cottonseed meal as the supplement. Four lots of 10 pigs each were fed the above ration. Lot 1 had no mineral supplement, lot 2 received 0.5 per cent of salt in addition, lot 3, 1.5 per cent of finely ground limestone, and lot 4 a mixture of salt and limestone. Lot 1 gained 836 lbs. during a 100-day test, while lots 2, 3, and 4 gained 158, 157, and 124 lbs. more, respectively, than lot 1. Lots 1 and 4 required 386.4 lbs. of feed each to produce 100 lbs. of gain, and lots 2 and 3 required 371.8 and 374.8 lbs., respectively. A chemical analysis showed both milo and cottonseed meal to be low in calcium, sodium, and chlorine.

Rice and rice by-products as feeds for fattening swine, E. H. Hughes (*California Sta. Bul. 420 (1927), pp. 24, figs. 6*).—The results of four trials are combined in this publication. A summary of these has been previously noted (E. S. R., 52, p. 73).

Fat samples were taken from the back fat and leaf lard of the pigs marketed from the first trial. These samples were analyzed after having been kept in cold storage at 28° F. for about a month. The Mulliken capillary tube method for determining the melting point of the fat was used. The hogs fed rice bran and rice polish produced fat that had a low melting point. A physical examination of these carcasses also classed them as soft. When fed with barley these feeds did not produce soft fat. All other lots were designated as hard.

The production of fall pigs in Alberta, R. D. Sinclair and J. P. Sackville (*Alberta Univ., Col. Agr. Bul. 7, 2. ed., rev. (1926), pp. 39, figs. 14*).—This is a revised edition of a publication previously noted (E. S. R., 53, p. 668).

Histological changes in the vaginal mucosa of the sow in relation to the oestrous cycle, K. M. Wilson (*Amer. Jour. Anat., 37 (1926), No. 3, pp. 417–431,*

figs. 7).—A study of 180 specimens, in which sections of the ovaries, tubes, and uteri were examined and the period of the oestrous cycle determined, was made in an attempt to describe the cyclic changes in the genital tract of the sow. Variations were compared with those of the different species already studied.

The study revealed that the vaginal mucosa, in common with other portions of the genital tract, undergoes a series of cyclic changes. The changes involve a growth and proliferation which begin shortly before oestrum and reach a maximum at the time of the oestrous period. After this, degenerative changes become marked, involving the formation of large vacuoles but with no true cornification of cells as in the rat and guinea pig. These degenerative changes are completed about two weeks after oestrum, and the vaginal mucosa goes into a resting state until just before the next oestrous cycle. At times during the cycle there are irregular migrations of leucocytes and mononuclear cells into the connective tissue.

In early pregnancy, the vaginal mucosa is almost histologically identical with the resting stage. The same appearance is found in the vaginal mucosa of immature animals. While vaginal smears show certain variations during the oestrous cycle, they are not sharply defined as in the rat and guinea pig and therefore can not be used to determine the exact phase of the oestrous cycle.

[Poultry experiments at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 88–93*).—The results of experiments are briefly noted.

Growth of chicks as affected by sunlight.—In continuing this work (E. S. R., 55, p. 671), five lots of 21-week-old White Leghorn chicks were fed the same mash as previously reported. Lots 1 and 2 received no sunlight. Lot 3 was exposed daily to 0.5 hour of direct sunlight, lot 4 to 0.5 hour of sunlight transmitted through a screen glass substitute, and lot 5 to 0.5 hour of sunlight through a fabric glass substitute. Lots 1 and 2 developed leg weakness between the fourth and fifth week. Lots 3, 4, and 5 made equally good growth for 12 weeks, and there was no difference in their behavior or in the ash content of femurs of these lots.

Calcium requirements of the growing chick.—This work (E. S. R., 55, p. 164) has been continued to determine the effect of adding excessive amounts of calcium. The basal ration consisted of yellow corn, wheat middlings, meat meal, and salt. Chicks fed this ration showed signs of leg weakness between the third and fourth week. The addition of 2 and 4 parts of calcium carbonate retarded the onset of leg weakness from 10 to 25 days, respectively. On adding 6 parts of calcium carbonate, leg weakness was brought on approximately 10 days earlier than in the lot receiving 4 lbs.

Three parts of disodium phosphate added to the 4 and 6 parts of calcium carbonate prevented leg weakness until the twelfth week. Small quantities of the antirachitic factor are necessary to prevent leg weakness and produce normal growth when calcium and phosphorus are properly adjusted in the ration.

The effect of cod-liver oil and ultra-violet light on egg production and hatchability.—Four groups of 10 pullets each were fed in continuation of work previously noted (E. S. R., 53, p. 873). Lot 1 received the basal mash composed of yellow corn, whole wheat, dried buttermilk, salt, and 4 per cent equal parts bone ash and fine oyster shells. Lot 2 received the same mash but was irradiated 10 minutes daily except Sundays at a distance of 3 ft. by a quartz mercury vapor lamp. Lot 3 received the mash plus 2 parts of cod-liver oil, and lot 4 received an additional 4 parts of equal amounts of bone ash and oyster shells.

Irradiating pullets and the feeding of cod-liver oil increased the egg production for six months from 27.7 eggs, as in the case of lot 1, to 65 and 61.1 eggs, respectively. Additional minerals practically doubled the egg production (54.7). Irradiation caused a marked increase in the hatchability of the eggs, but cod-liver oil exerted no beneficial effect. Increased mineral intake tended to improve the hatchability. The percentage of fertile eggs hatched was 47.77, 62.95, 40.59, and 57.74, respectively, in the various lots.

Fat-soluble vitamin content of hen's eggs.—Four lots of hens were fed a basal ration of dry mash composed of yellow corn, wheat, oats, wheat middlings, bran, and meat scrap, with oyster shells ad libitum, to determine the variation in the fat-soluble vitamin content of eggs. Three lots were confined indoors and the only sunlight they received was through window glass. The first lot received the basal ration plus 2 parts of cod-liver oil, the second lot received the basal ration only, and the third lot the basal ration plus chopped alfalfa hay ad libitum. A fourth lot in addition to the mash had access to bluegrass range.

Increasing amounts of egg yolks were fed daily to rats on a vitamin A-deficient ration. The results showed that the yolks of eggs from pens receiving cod-liver oil and those on range were approximately 5 times as potent as yolks of eggs from the basal ration lot. The addition of alfalfa hay also tended to increase the vitamin A content. In determining the antirachitic value of these yolks, it was found that the yolks from the range pen were 10 times as potent and from the cod-liver oil group 5 times as potent as the basal group. Alfalfa hay did not increase the vitamin D content.

The influence of the time of hatch on the laying ability of Single-Comb White Leghorn pullets, L. N. Berry and A. L. Walker (*New Mexico Sta. Bul. 158 (1927), pp. 18, figs. 2*).—Preliminary work on this experiment has been previously noted (E. S. R., 55, p. 467).

February and March hatched groups made good growth and started laying at an early age, but went through a fall molt that cut down their production and their return since the molt came during the period of high prices. April-hatched chicks did not go through this fall molt, and as a result had the highest average annual production and gave the greatest net return of any of the lots. The groups hatched in May, June, and July showed the effect of hot weather on retarding growth and maturity. August and September hatches showed improvements in all respects over the above groups. October hatching was an improvement over summer hatching, but not as good as the spring hatch. Chicks hatched in November were slow in maturing but had a rather high production for the year.

This experiment indicates that the early spring months are favorable for hatching chicks; (1) the vigor and vitality of the breeding stock is at its peak, (2) moderate temperatures are superior to either high or low temperatures during the brooding season, (3) pullets that mature early produce a greater number of eggs during the fall and winter when prices are high, (4) early hatched cockerels develop rapidly, are ready for use as breeders the next year, and the excess find a ready market as broilers and friers, (5) green feed is more succulent and insects of all kinds are plentiful during the spring months, cutting down the cost of production, and (6) poultry parasites are not as bad in the spring as later in the summer, and early hatched chicks are not as susceptible to parasitic infestation.

Studies of variation in hatching quality of eggs (*Texas Sta. Rpt. 1926, p. 59*).—In the study of this problem data have been secured from 62 individual hens and 21 different flocks. The eggs from the individual hens ranged in

hatchability from 0 to 100 per cent and with the flocks from 32 to 77.1 per cent. The average hatch of the 50,520 eggs set in 1926 was 69.8 per cent as compared with 65.3 per cent the preceding year. Seasonal conditions, flock management, handling conditions, and the breed are factors influencing the hatchability of eggs.

The races of domestic fowl, M. A. JULL (*Natl. Geogr. Mag., 51 (1927), No. 4, pp. 379–452, pls. 16, [figs. 60]*).—This article describes in a popular manner the origin and early development of fowls. The habits, the breeding characteristics, the methods used by breeders for improving the various qualities, and the history and characteristics of the breeds are discussed. The article is well illustrated, and an appendix of colored plates shows the more common breeds of poultry.

On the determination of the sexes of carrier-pigeons, I. IWATA (*Jour. Col. Agr., Imp. Univ. Tokyo, 7 (1926), No. 4, pp. 399–410, pl. 1, figs. 2*).—Methods for determining the sex of pigeons at different ages are described. These determinations are based upon the difference between the nasal protuberances of the beak and upon the size and shape of the cloacal regions. These latter differences are exact but vary according to the age of the individual.

Mink raising, L. D. MCCLINTOCK (*Oshawa, Ont.: Fur Trade Jour. Canada, 1926, pp. 58, figs. 9*).—This book contains directions for the breeding and raising of mink based upon the author's experiences.

Chinchilla rabbits: Standard, heavyweight, and giant, E. H. STAHL (*Kansas City, Mo.: Outdoor Enterprise Pub. Co., 1926, pp. 151, figs. 61*).—This book on the Chinchilla rabbit describes the methods of buying, feeding, breeding, and selling these animals. The American varieties, with descriptions of the standards, are included.

DAIRY FARMING—DAIRYING

The cattle-breeder's handbook, J. A. S. WATSON, J. CAMERON, and G. H. GARRAD (*London: Ernest Benn, 1926, pp. 144*).—This book deals with the types of beef, dairy, and dual-purpose cattle, and a short history and description of the breeds of each type are given. Notes and suggestions are made on the breeding, feeding, and management of each class of cattle.

[Experiments with dairy cattle at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 77, 79, 80*).—The results of three experiments are noted.

Legumes for milk production.—Two Holstein cows were fed alfalfa hay and ground corn only. In 13 months 1 cow produced 11,040 lbs. of milk and 382 lbs. of fat and dropped a 105-lb. calf. The other cow gave in 12 months 11,276 lbs. of milk and 351 lbs. of fat and dropped a 90-lb. calf.

A fly spray for cows.—A fly spray consisting of a saturated solution of oil of tar and insect powder (Pyrethrum) in kerosene with a cup of cresol compound in each gallon was used. The mixture was filtered through a cloth and applied with a hand compressed-air sprayer. Forty cows were divided into two equal groups, and each group was sprayed on alternate weeks after the morning milking with the above mixture. Flies were counted on the animals as they came in from pasture in the afternoon, and it was found that there were 70 per cent fewer flies on the cows sprayed. Milk production showed little or no relation to the number of flies on the cows.

Protein requirement of dairy cows.—This study is being continued with two groups of 3 cows each (E. S. R., 54, p. 768). One group received a ration having a nutritive ratio of 1:2 and the other group 1:13. Two cows have completed a year's record on the high-protein ration of 8,781 and 10,251 lbs. of

milk, respectively. No noticeable abnormalities developed. None of the cows on the low-protein ration have as yet completed a year's record.

[Investigations with dairy cattle at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 57, 58*).—Two projects are briefly noted.

Constructive breeding of dairy cattle.—Records of the cows at the station have been corrected for age and to a standard 305-day lactation period. The average mature equivalent 305-day record in the experimental herd up to January 1, 1926, has been 5,514 lbs. of milk and 282.5 lbs. of fat. Prediction formulas for the breeding value of bulls and cows have been developed from these records. These formulas are believed to be accurate.

Value of rice by-products as a feed for dairy cows.—Three double reversal feeding tests of 90 days each have shown that rice bran is about 75 to 80 per cent as efficient as corn chop. The bran did not injure the flavor of whole milk even when fed in large quantities.

Feeding the dairy cow, A. C. M'Candlish (*West of Scot. Agr. Col. Bul. 106 (1926), pp. 189–290*).—A popular presentation discussing the principles and practices of feeding and the types of feed and giving suggestions for compounding rations. Appended are tables showing the digestible nutrients required by cows, the digestible nutrients in some common feeds, winter rations, and the cost per pound of digestible nutrients and digestible crude protein in some common feeding stuffs.

Quality of silage for milk production as affected by stage of maturity of corn, S. I. Bechdel (*Pennsylvania Sta. Bul. 207 (1926), pp. 16*).—In continuing this study (E. S. R., 49, p. 274), the college White Cap Dent variety of corn was used. The first silo was filled August 1 when the kernels had just started to fill. Fifteen days later the second silo was filled when the corn was in the full milk stage, and two weeks later when the grain was well dented the third silo was filled. Comparisons of the effect on milk production were made between the immature and the medium mature, the medium mature and the mature, and the immature and mature types of silage. The reversal system of feeding was used.

In every case it was found that the more mature the silage the more efficient it was in the production of milk and butterfat. The author recommends that for Pennsylvania conditions varieties of corn for silage should be grown that will attain either the milk or early dough stage growth before killing frosts. Such varieties can be more economically harvested and require less storage space per unit of digestible dry matter than the late maturing varieties.

Rice bran as a feed for dairy cows, J. L. Lush and F. Hale (*Texas Sta. Bul. 352 (1927), pp. 22, fig. 1*).—Three experiments of 90 days each, the first starting November 25, 1925, and the last ending September 5, 1926, were conducted to test the value of rice bran. In the first trial 9 cows were used in group A and 8 in group B. In the other two trials 9 cows were used in each group. The cows were turned out to pasture or in milo stalk fields whenever the weather permitted. Water and salt were available at all times.

The double reversal method of feeding was used in these tests. Rations were changed every 30 days, and the first 10 days of each period was considered preliminary. The grain ration for one group consisted of ground milo 300 lbs., prime cottonseed meal and wheat bran 100 lbs. each, bone meal 10 lbs., and salt 5 lbs. The other group received a ration consisting of ground milo 150 lbs., rice bran 200 lbs., wheat bran and cottonseed meal 100 lbs. each, bone meal 11 lbs., and salt 5.5 lbs. Cottonseed hulls were fed ad libitum in racks in the open. During the first trial prairie hay was fed to 4 cows in each group ad libitum. Sorghum silage was fed to both groups during 42 days of the first 90-day trial and during the last 12 days of the third trial.

It is concluded that rice bran can replace milo chops at the rate of 4 lbs. of rice bran to 3 lbs. of milo chops, and can make up as much as 36 per cent of the ration without decreasing the milk yield. Rice bran that is not rancid has no effect upon the flavor of the milk. Large amounts of rice bran make the ration rather unpalatable, especially when pasture is abundant, but cows differ in their distaste for rice bran. The net energy content of rice bran is estimated to be from 75 to 80 per cent as large as that of milo chops and the digestible protein content about the same. Rice bran varies considerably in composition due to different processes of manufacture and the amount of hulls present. Rice bran in this experiment proved to be a desirable and economical dairy feed when it was not rancid. It is a highly seasonal feed, for it is of best quality during the fall and winter when pasture is scarce. At this time cows eat it more readily than when pasture is available.

Dietary factors influencing calcium assimilation.—VIII, IX (*Jour. Biol. Chem.*, *71* (*1927*), *No. 2, pp. 263–280*).—A continuation of this series of studies (E. S. R., 56, p. 464).

VIII. *The calcium level and sunlight as affecting calcium equilibrium in milking cows*, E. B. Hart, H. Steenbock, H. Scott, and G. C. Humphrey (pp. 263–269).—An attempt was made to show the effect of the calcium level of the ration upon calcium equilibrium. The preliminary work and the ration used have been previously noted, except that 0.5 lb. of marl ($CaCO_3$) was fed daily to each individual. This made the percentage of CaO in the ration approximately 1.5 per cent as compared to 0.52 per cent in the unsupplemented ration.

The results indicated that when the daily intake of CaO is about 200 gm. a positive balance could be maintained whether the cows were indoors or in direct sunlight. There was sufficient of the antirachitic factor in the green grasses cut from 1 to 5 p. m. and the remainder of the ration to maintain calcium balance when the intake of calcium was at a high level. It is evident from the results obtained that the ordinary summer pasture (nonlegume) ration of high-producing cows should be supplemented with some lime carrier.

IX. *Further observations on the influence of cod liver oil on calcium assimilation in lactating animals*, E. B. Hart, H. Steenbock, S. W. Kletzien, and H. Scott (pp. 271–280).—Milk goats were used in continuation of these studies on calcium assimilation (E. S. R., 46, p. 566). The ration fed consisted of chopped commercial alfalfa hay and a grain mixture of yellow corn, wheat bran, oil meal, and salt (59 : 25 : 15 : 1). Two parts of the grain mixture were fed to 1 part of alfalfa hay. The goats had a preliminary feeding period of from 2 to 4 weeks on this ration.

Cod-liver oil was saponified by boiling in 20 per cent alcoholic KOH, cooled, and diluted with water. The mass was then extracted with ether and evaporated. From 280 cc. of raw oil, this residue usually amounted to 1.5 gm. The residue was diluted with dextrin to a weight of 3.5 gm. and divided into seven equal parts, each part being equivalent to approximately 40 cc. of raw oil. The daily dosage was given in a gelatin capsule. This method of administering did not disturb the appetite of the animals nor improve calcium assimilation.

The authors then decided to administer nonsaponified cod-liver oil in solution with refined corn oil. The data revealed that the nonsaponified fraction of cod-liver oil fed to lactating goats in capsules was not effective in improving calcium assimilation, but when this fraction was redissolved in corn oil marked improvement in calcium assimilation occurred. The corn oil had no effect on assimilation. Accustoming animals to direct cod-liver oil feeding for an extended period before metabolism work began showed that the material was effective in improving calcium assimilation. The data tend to prove that vitamin D plays the same part in the lactating animal as in the growing animal.

Textbook of the chemistry and physiology of milk, W. GRIMMER (*Lehrbuch der Chemie und Physiologie der Milch. Berlin: Paul Parey, 1926, 2. ed., rev., pp. XI+326, figs. 31*).—This is a revised edition of the book previously noted (E. S. R., 24, p. 13).

The care and handling of milk, H. E. ROSS (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1927, pp. XV+342, figs. [50]*).—This is a textbook covering all the phases of the care and handling of milk. Discussions of the physical and chemical properties of milk, the application of microbiology to market milk, the food value and use of milk, the grades, the production of clean milk, the buildings in which milk is handled, the operation of the milk plant, and the problems of transportation and distribution are taken up.

Producing clean milk, A. G. LOCHHEAD (*Canada Dept. Agr. Pamphlet 79, n. ser. (1927), pp. 16, figs. 6*).—This is a popular discussion of the importance of clean milk. The basis of clean milk, the nature of bacterial contamination, diseases transmitted by milk, the function of pasteurization, sources of contamination, and proper methods for maintaining clean milk are some of the topics discussed.

Economics of production of grade "A" (tuberculin-tested) milk, V. LIVERSAGE (*New York: Oxford Univ. Press, Amer. Branch; Oxford: Clarendon Press, 1926, pp. 56*).—This is the result of a survey concerning the equipment, labor, and cost of producing grade A (tuberculin-tested) milk. Tables are appended which give the detailed data obtained in the study.

The removal of the onion or garlic flavor and odor from milk, M. B. MACDONALD and E. M. CRAWFORD (*Jour. Home Econ., 19 (1927), No. 2, pp. 65–69*).—In this contribution from the Tennessee Experiment Station a simple method of removing the garlic odor and taste from milk is described. This consists essentially in shaking the milk two or three times with about one-tenth its volume of pure mineral oil and filtering the milk after each shaking through several thicknesses of wet cotton cloth clamped over the bottom of an ordinary milk strainer, the filter retaining the oil but not the milk. A fresh filter should be used for each separation.

It has been determined that this treatment satisfactorily removes the undesirable odor and taste, with no loss in the protein, carbohydrate, or ash content of the milk and only slight loss in fat. The treatment does not affect the butter-making qualities of the cream in the milk, but can not be applied to soured milk on which the cream has risen nor to separated cream or butter. Satisfactory methods have not yet been devised for the treatment of large quantities of milk, although fairly good results have been secured by rubbing or grinding the oil and milk together in a suitably constructed mill. More than 95 per cent of the mineral oil can be recovered for further use by successive washings with water, 10 per cent sodium carbonate solution, and water, followed by blowing air or steam through the oil.

Removal of onion or garlic flavor and odor from milk, M. B. MACDONALD and E. M. CRAWFORD (*Tennessee Sta. Circ. 14 (1927), pp. 2*).—This circular, which is based upon the study noted above, gives simple directions for the treatment of the milk, the separation of the oil from the milk, and the purification of the used oil.

Quality tests for condenseries, F. J. DOAN (*Butter, Cheese, and Egg Jour., 1927, Mar. (mo. ed.), pp. 32–34, 36*).—The author describes the acidity, alcohol, methylene blue, fermentation, and boiling tests which are used in determining the quality of milk for use in condenseries. The limitations and value of these various tests are also described. It is deemed advisable to subject sam-

ples to the process that the main batch must undergo in order to check the quality. These are not the only tests that may be used, but for the ordinary condensary they are the ones most likely to be practicable and most likely to give satisfaction.

Curdling tests with milk treated with calcium chloride [trans. title], B. PLATON (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 310* (*1926*), *pp. 16; Eng. abs., pp. 14–16*).—The object of the test was to determine the advantage of adding calcium chloride to the curdling milk before the commencement of coagulation in cheese making. In different vats 0.1, 0.2, 0.5, and 1 gm. of calcium chloride per liter of milk were added and compared with control samples. The process of curdling was carried out as uniformly as possible, so that each parallel curdling contained the same percentage of water.

The addition of calcium chloride shortened the period of coagulation, reduced the time for working the cheese in the vats, and up to 0.2 gm. per liter of milk facilitated the work in the vats. Larger amounts caused too rapid coagulation and such a rapid production of whey that work had to be rushed too fast to be considered advantageous. The addition of calcium chloride caused a higher yield of cheese solids in every case but one. In the case of half-fat cheeses the increased yield was so small as to be negligible, amounting with 0.5 and 1 gm. per liter to 1 per cent of the total yield. When whole-fat cheeses were used the yield of solids was 3.2 per cent greater in the calcium chloride groups than in the controls.

About 75 per cent of the nitrogen contained in the milk was converted into cheese. In one experiment using 0.2 gm. of calcium chloride per liter, only one-half as much rennet was required as in the control groups. The cheeses were analyzed at the end of two and four months' storage, when it was found that the calcium chloride cheese contained only 1.2 per cent less soluble nitrogen than the control cheese. The addition of calcium chloride did not affect the taste, texture, or consistency of the cheese.

The composition of Canadian Cheddar and process cheese, E. G. HOOD and A. H. WHITE (*Canada Dept. Agr. Bul. 79, n. ser.* (*1927*), *pp. 18*).—An analysis of 444 samples of Cheddar cheese showed an average composition of moisture 34.82 per cent, fat 33.75, fat in water-free substance 51.77, and casein and other solids 31.43 per cent. There was no definite relation between the texture and the ratio of the principal constituents.

VETERINARY MEDICINE

Veterinary parasitology, G. MAROTEL (*Parasitologie Vétérinaire. Paris: J.-B. Baillière & Sons, 1927, pp. VII+545, figs. 302*).—A compendium of the parasites and parasitic diseases of animals.

Report of the proceedings of the twenty-ninth annual meeting of the United States Live Stock Sanitary Association (*U. S. Livestock Sanit. Assoc. Rpt., 29* (*1925*), *pp. 264, figs. 7*).—The papers presented at this meeting of the association, held at Chicago in December, 1925 (E. S. R., 53, p. 178), include the following: Experiences of a Laboratory Worker in the Deficiency Diseases of Live Stock, by H. Steenbock (pp. 28–31); Report of Committee on Nutritional Diseases, by A. F. Schalk (pp. 32–39); Sanitation in the Control of Swine Diseases, by L. Van Es (pp. 41, 42); The Immunization of Young Pigs Against Hog Cholera, by M. Dorset and S. S. Buckley (pp. 43–51); Studies of Enteritis in Swine, by C. Murray, H. E. Biester, P. Purwin, and S. H. McNutt (pp. 52–56); Iodine as a Disinfectant Against Nematode Eggs and Larvae, by W. L. Chandler

(pp. 57–62); Report of Committee on Diseases of Swine, by C. H. Stange et al. (pp. 62, 63); Report of the Committee on Foot-and-Mouth Disease, by A. W. Miller et al. (pp. 69–76); Report of the Committee on Diseases of Live Stock, by D. H. Udall (pp. 77–80); Legislation, by H. R. Smith (pp. 81–83); Tuberculosis Eradication and Its Relation to the Dairy Industry, by A. J. Glover (pp. 83–89); Tuberculosis Eradication and Its Relation to the Packing Industry, by O. Meyer (pp. 89–93); Tuberculosis from the Standpoint of Meat Inspection, by E. C. Joss (pp. 106–110); Tuberculosis Eradication in Iowa, by M. G. Thornburg (pp. 111–113); Legal and Other Phases Involved in Area Work, by C. E. Cotton (pp. 114–131); Some Proposed Changes in the Requirements for Modified Tuberculosis-Free Areas, by E. Records (pp. 131–135); Tuberculosis Work in Poultry, by E. L. Stubbs (pp. 136–141); The Relation of Avian to Porcine Tuberculosis, by R. Graham, I. B. Boughton, and E. A. Tunnicliff (pp. 142–157); Present Status of the Cooperative Tuberculosis Eradication Work, by J. A. Kiernan (pp. 158–168); Report of the Committee on Bovine Infectious Abortion, by C. P. Fitch et al. (pp. 168–172); Report of the Committee on Uniform Regulations, by U. G. Houck and A. W. Miller (pp. 178–188); Studies in Transmission of Bacillary White Diarrhea in Incubators, by W. R. Hinshaw, C. W. Upp, and J. M. Moore (pp. 188–191); Report of Committee on Poultry Diseases, 1925, by L. Van Es et al. (pp. 193–196); Skin Diseases, by C. G. Lamb (pp. 206–209); The Vaccinal Immunization of Animals Against *Bacterium abortus* (Bang) Infection, by I. F. Huddleson (pp. 210–215); Some Reasons Why States Are Not Making Progress in Tick Eradication, by C. A. Cary (pp. 219–223); Indifference—Cattle Tick Eradication, by J. H. Bux (pp. 223–226); and "Passing the Buck" in Live Stock Sanitary Control, by P. F. Bahnsen (pp. 227–232).

[Report of work in veterinary science at the Texas Station] (*Texas Sta. Rpt. 1926, pp. 12–16*).—In investigational work in animal pathology particular attention was given to the project on loin disease of cattle, it being conducted in continuation of the work previously noted (E. S. R., 55, p. 371). The studies at the main laboratory were aimed at the finding of a specific organism. In this work, bones and other carcass materials from affected animals were dried, ground, and fed to cattle in varying amounts. Of the animals thus fed for a period of 30 days, one developed what was considered a light case of loin disease, it being very similar to if not identical with the light cases previously observed. Negative results were obtained in the search for the organism. In control work at the field laboratory near Bammel, in Harris County, the feeding of bone meal increased the gain in weight during the favorable season, and the cows fed on bone meal reared better calves. The feeding of bone meal effectually prevented "creeps" and reduced the losses from diseases other than those of an infectious character. It was found that finely ground rock phosphate can not be used to take the place of bone meal, that the feeding of bone meal may cause the animals to forego bone chewing, but that calves approximately one year old may occasionally chew a bone. In all of the 7 cases of loin disease occurring in the Bammel fields the animals contracting the disease were known to be bone chewers, even though all but one received bone meal, showing that bone meal is not a preventive of bone chewing in all cases.

In work with swamp fever of equines experiments were conducted in which formin, formaldehyde, tartar emetic, mercurochrome 220, and Bayer 205 were used without satisfactory results. The administration of serum from an animal recovered from and apparently immune to the disease gave no indication of curative value.

A brief statement is made of the progress of studies of infectious bovine abortion. The results of vaccination work indicate that the use of live cultures has in no way reduced the breeding efficiency of the herd.

Annual report on the diseases of livestock in 1925 [trans. title], J. L. van Eck (*Dept. Landb., Nijv. en Handel Nederland. Indië, Jaarverslag Burgerl. Veeartsenijk. Dienst, 1925, pp. 143*).—A report on the occurrence of and control work with diseases of livestock in Java and Madura.

Live stock diseases report, No. 2, M. Henry (*N. S. Wales Dept. Agr., Sci. Bul. 28 (1927), pp. 19*).—This is a report (E. S. R., 54, p. 870) of control work conducted during the year ended June 30, 1926, under the headings of State disease control services, pleuropneumonia contagiosa, lice and tick in sheep, infectious diseases of swine, contagious mammitis, tuberculosis, and anthrax.

Contributions to the study of the filterable viruses (*Jour. Roy. Micros. Soc., 46 (1926), No. 4, pp. 253–264, pl. 1, figs. 4*).—Papers are here presented on Bovine Pleuro-pneumonia, by J. E. Barnard (pp. 253–257); The Morphology of Bovine Pleuro-pneumonia, by J. Smiles (pp. 257–261); and A New Method of Cultivating Micro-organisms, by F. V. Welch (pp. 262–264).

The bacteriophage and its behavior, F. d'Herelle (*Le Bactériophage et Son Comportement. Paris: Masson & Co., 1926, 2. ed., rev., pp. 551, figs. 27*).—This is a second revised edition of the work, an English edition of which has been noted (E. S. R., 48, p. 675).

Oxygen poisoning in mammals, C. A. L. Binger, J. M. Faulkner, and R. L. Moore (*Jour. Expt. Med., 45 (1927), No. 5, pp. 849–864, pls. 2, fig. 1*).—The authors find oxygen in concentrations of over 70 per cent of an atmosphere to be poisonous to dogs, rabbits, guinea pigs, and mice, the poisonous effects manifesting themselves in drowsiness, anorexia, loss of weight, increasing dyspnea, cyanosis, and death from oxygen want. The cause of the oxygen want is said to be a destructive lesion of the lungs.

The pathogenicity of Bacillus suipestifer for man [trans. title], R. Kopp (*Deut. Med. Wchnschr., 52 (1926), No. 51, pp. 2156, 2157*).—The author records a severe case of *B. suipestifer* infection in a young man, whose blood agglutinated paratyphoid B only slightly.

Thelazia infection of man and mammals in China, E. C. Faust (*Roy. Soc. Trop. Med. and Hyg. Trans., 20 (1927), No. 5–6, pp. 365–369, pls. 2*).—A study of the original material of ocular nematodes from man and the dog in China, as well as material recently secured from a dog and a rabbit in Peking, is considered to demonstrate the correctness of R. T. Leiper's[1] view that the human and dog specimens from China belong to the species *T. callipaeda*, and to provide evidence that the rabbit is another host of this species of Thelazia. *T. rhodesii* from cattle in China is said to be new.

Vesicular stomatitis in its relation to the diagnosis of foot-and-mouth disease, W. E. Cotton (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 3, pp. 313–332*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry.

The author has found that vesicular stomatitis is often very difficult to differentiate from foot-and-mouth disease by examination of the lesions alone, and that lesions indistinguishable from those of foot-and-mouth disease do sometimes occur on the feet of cattle. It is pointed out that guinea pigs can not be used to distinguish the two diseases from each other since the guinea pig seems to react so nearly alike to both. Unless some other test animal can be found, main dependence must be placed upon the horse, which seems to be highly resistant if not altogether immune to foot-and-mouth disease but very

[1] Brit. Jour. Ophthalmol., 1 (1917), pp. 546–549.

susceptible by inoculation on the tongue to vesicular stomatitis. The virus of vesicular stomatitis can be kept for at least a month in a moist state and unexposed to light in the ice box, but it seems to die very quickly under natural conditions. Actual contact with an affected animal in the early stages of the disease seems to be necessary to transmit it. A real and fairly lasting immunity seems to be produced by an attack of the disease. It is pointed out that while the lesions of vesicular stomatitis in cattle and guinea pigs are much like those of foot-and-mouth disease yet the two diseases are so dissimilar in contagiousness and in the immunity they produce that they may be said in the latter respects to be at the opposite ends of the scale.

Vesicular stomatitis, W. E. COTTON (*Vet. Med., 22 (1927), No. 5, pp. 169–175*).—This account is based upon the investigations above noted.

No-lesion tuberculin reactions, E. C. SCHROEDER (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 1, pp. 57–67*).—A contribution from the U. S. D. A. Bureau of Animal Industry.

The sterility of cows, J. RICHTER (*Die Sterilität des Rindes. Berlin: Richard Schoetz, 1926, 3. ed., rev. and enl., pp. V+189, figs. 52*).—This is a revised and enlarged edition of the work by Albrechtsen, previously noted (E. S. R., 38, p. 286). A list of 140 references to the literature is included.

Experiments on the longevity of Alcaligenes abortus, F. P. MATHEWS (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 1, pp. 80–82*).—In studies conducted at the Indiana Experiment Station, 2 of 5 strains of this organism of bovine origin in naturally infected material retained their virulence for guinea pigs 120 but not 150 days after expulsion from the infected animal.

Infectious abortion and its relation to Malta fever [trans. title], J. VIDAL MUNNÉ (*Rev. Hig. y Sanid. Pecuarias [Madrid], 17 (1927), No. 4, pp. 265–281*).—This is a contribution from the Academy of Medicine and Surgery, Barcelona, presented in connection with a list of 97 references to literature.

Infectious abortion of cattle, G. H. ROBERTS and L. P. DOYLE (*Indiana Sta. Circ. 140 (1927), pp. 4*).—A brief practical account.

Contagious abortion in cattle (*North Ireland Min. Agr. Leaflet 18, rev. (1927), pp. 5*).—This is a practical account.

A contribution to the histology and formation of lesions in the liver and the kidneys in blackleg of cattle [trans. title], P. COHRS (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 30 (1927), No. 3–4, pp. 228–256, pls. 2*).—This report of a patho-anatomical study includes a list of 46 references to the literature.

Further studies in contagious bovine pleuro-pneumonia experiments to demonstrate the occurrence of two distinct types of the virus in Victoria, G. G. HESLOP (*Roy. Soc. Victoria, Proc., n. ser., 36 (1924), No. 2, pp. 83–91*).—The studies here presented are in continuation of those previously noted (E. S. R., 48, p. 484), and deal with the agglutination reaction which has been used extensively in Victoria for 2 years with very satisfactory results.

Louping-ill, S. STOCKMAN (*Highland and Agr. Soc. Scot. Trans., 5. ser., 36 (1924), pp. 1–24, figs. 9*).—A further account of this disease (E. S. R., 55, p. 72).

Stomach worms and nodular worms in lambs, D. S. BELL (*Ohio Sta. Bul. 401 (1926), pp. 427–470, figs. 23*).—This is a report on prevention and control by methods of management and medicinal treatments. The results of post-slaughter examination of experimental animals are summarized in tabular form. It is shown that lambs raised in the barn with their dams until weaning and then placed on continuous, clean forage of rape and kept there throughout the grazing season became somewhat infested with stomach worms. When the copper sulfate solution was administered to lambs thus managed at regu-

lar monthly intervals after weaning, the lambs were entirely free from stomach worms, while 12 stomach worms were found in the lambs treated with nicotine sulfate. One nodule was found in one of the lambs kept under this method of management, all the other lambs being entirely free. Lambs kept with infested untreated dams on permanent pasture until weaning and thereafter on continuous forage became lightly, and in some cases heavily, infested with stomach worms. The administration of copper sulfate solution at regular monthly intervals reduced the infestation with stomach worms almost 99.6 per cent, while the nicotine sulfate solution reduced the infestation 64.8 per cent. The lambs that grazed with their infested dams on permanent pasture during the grazing season became, in most cases, heavily infested with both stomach worms and nodular worms. The administration of copper sulfate as a vermifuge at regular monthly intervals after weaning time resulted in a marked reduction in the number of stomach worms present.

Stomach and nodular worms in lambs (*Ohio Sta. Bul. 402 (1927), pp. 87, 88*).—These data relate to work continuing that noted above.

A new drench for stomach worms in sheep, F. WHITEHOUSE (*Agr. Gaz. N. S. Wales, 38 (1927), No. 1, pp. 51–58, figs. 2*).—The systematic use of a drench, 3 dr. being administered to the adult sheep at 28-day intervals, resulted in the apparent disappearance of the stomach worm from the flock. This drench is composed of white arsenic 4 oz., powdered bluestone 16 oz., commercial muriatic acid 12 oz., and water 1.5 gal. The dosage is given as 6-tooth and over 3 dr., 4-tooth and over 2.5 dr., 2-tooth and weaners 1.5 dr., and lambs to 6 months 0.5 to 1 dr.

Observations on the incidence of Metastrongylus brevivaginatus and Metastrongylus elongatus in pigs in central Wales, E. A. LEWIS (*Jour. Helminthol., 4 (1926), No. 3, pp. 123–126*).—This is an account of investigations made in connection with an examination of an average of 50 sheep and 8 pigs weekly for a period of 5 months, in the course of which *M. brevivaginatus* and *M. elongatus* were found present in the bronchioles of 50 per cent of the pigs. Generally both species were present in the same animal.

Grass sickness in horses, J. F. TOCHER (*Highland and Agr. Soc. Scot. Trans., 5. ser., 36 (1924), pp. 65–83, figs. 2*).—In this account the author presents evidence to show that *Bacillus botulinus* is the cause of the grass sickness in horses met with in Scotland.

Some developments in canine distemper prophylaxis, D. I. SKIDMORE and J. S. BUCKLEY (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 2, pp. 218–224*).—This is a contribution from the U. S. D. A. Bureau of Animal Industry.

Bacillary white diarrhea in hens (*Ohio Sta. Bul. 402 (1927), p. 99*).—This is a report of two groups of eight hens each kept under observation for 8 months beginning May 20, 1925, the first group consisting of fowls giving positive agglutination reactions in serum dilutions of 1:50 or more with *Salmonella pullorum* suspensions, and the second group having given negative agglutination. Agglutination tests were made at intervals, trap nest records were kept of the individual hens, and hatchability tests were conducted with available eggs. The results obtained led to the following tentative conclusions:

The agglutination test for *S. pullorum* infection in hens, using a serum dilution of 1:50, is not appreciably changed either during or after discontinuance of egg production. *S. pullorum* infection as determined by the agglutination test can, in some instances, be transmitted to nonreactor hens by their association with reactor hens. Eggs from nonreactor hens hatch a

larger percentage of live chicks than those from reactor hens. Egg production is larger in nonreactor hens.

In the course of the work the wattle or intradermic test was used to a limited extent, being checked against the agglutination test. The wattle test fluid was prepared from rewashed agar cultures of *S. pullorum* organisms, the final sedimentation being suspended in 5 per cent phenolized saline solution, and concentrated to the density of a No. 7 tube of the McFarland nephelometer. The results of the work indicate that either test selects a similar number of birds that may be classed as infected. The agreement of the two was fairly close although not absolute.

Bacillary white diarrhoea of chickens, G. Martinaglia (*Farming in So. Africa, 1 (1927), No. 12, pp. 447, 448*).—In this brief account the author calls attention to the fact that bacillary white diarrhea occurs in the Union of South Africa, having recently been diagnosed at the Onderstepoort Laboratory.

The pathology of fowl paralysis, A. M. Pappenheimer, V. Cone, and L. C. Dunn (*N. Y. Path. Soc. Proc., n. ser., 25 (1925), No. 6–8, pp. 106–109*).—This contribution from the Connecticut Storrs Experiment Station and the department of pathology of the College of Physicians and Surgeons, Columbia University, deals briefly with the pathological changes encountered in fowl paralysis.

Tuberculosis in poultry, B. A. Beach, F. B. Hadley, and J. G. Halpin (*Wis. Agr. Col. Ext. Circ. 210 (1927), pp. 8, figs. 4*).—A practical account.

Vaccination of poultry, S. H. McNutt (*Jour. Amer. Med. Assoc., 69 (1926), No. 4, pp. 472–477*).—The author reports that his use of commercial mixed-infection bacterins, a pox virus vaccine, and hemorrhagic septicemia aggressin failed to render any protection.

A field experience with internal parasites of chickens, J. Patterson (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 2, pp. 228–230*).—The author reports that a combination quinine-betanaphthol treatment used on 10,425 chickens in 83 flocks proved highly efficient.

Recommendations for the control of intestinal worms in poultry, R. T. Parkhurst (*Idaho Sta. Circ. 45 (1927), pp. 4, fig. 1*).—A brief account, in which the use of nicotine sulfate for roundworms, as reported by Freeborn (E. S. R., 52, p. 59), and kamala for tapeworms, as reported by Hall and Shillinger (E. S. R., 55, p. 178) and tested at the Wisconsin Station (E. S. R., 55, p. 399), are recommended.

AGRICULTURAL ENGINEERING

Physics in industry, W. Makower and B. A. Keen (*New York: Oxford Univ. Press, Amer. Branch, 1926, vol. 4, pp. 63, pls. 4, figs. 25*).—A series of lectures on the subject is given, including one on the physicist in agriculture, with special reference to soils and soil dynamics subjects, and which is of particular interest to those engaged in research in tillage and traction machinery.

Federal irrigation projects (*Washington: U. S. Dept. Int., Bur. Reclam., 1926, pp. II+50, figs. 30*).—General information is given regarding the irrigation projects of the U. S. Bureau of Reclamation.

Some factors affecting the irrigation requirements of deciduous orchards, F. J. Veihmeyer (*Hilgardia [California Sta.], 2 (1927), No. 6, pp. 125–291, pls. 3, figs. 44*).—This is a contribution resulting from cooperative investigations made by the station, the U. S. D. A. Bureau of Public Roads, and the California State Department of Public Works. The purpose is to present certain data relating to soil moisture conditions prevalent in commercial orchards, and to analyze the causes resulting in losses of moisture from irrigated soils. The experiments included (1) observations of moisture conditions

in commercial orchards in the Santa Clara Valley, (2) observations of orchards at the station, (3) studies of the behavior of young prune trees in tanks under controlled conditions, and (4) a comparison of moisture losses by evaporation and transpiration from soils and studies of moisture losses from the soil in tanks and from field plats.

The soil moisture records presented indicate that the use of water by mature prune trees does not seem to be influenced by the amount of water present in the soil, provided the soil moisture content has not been reduced below the wilting coefficient. The intensity of atmospheric evaporating power and leaf area seemed to determine the use of water by the trees. The amount of available water present in the soil and the state of growth of the trees, except in so far as this affected leaf area, seemed to be of secondary importance. The yields, drying ratios, size, and quality of prunes produced did not seem to be related to the frequency or amounts of water applied to the soil. Mature prune and peach trees did not seem to be affected by changes in soil moisture content unless the moisture content of the upper 6 ft. of soil was reduced to about the wilting coefficient. The results obtained in studies of Muir peaches were in general the same as those obtained with mature prune trees.

Studies of young prune trees grown in tanks under controlled conditions indicated that the use of water by these young trees was not influenced by the amount of water in the soil above the wilting coefficient. Under comparable atmospheric conditions the rate of extraction of moisture by the roots of the trees was the same whether the moisture content of the soil above the wilting coefficient was high or low. Within the range of experimental conditions used, atmospheric conditions had little influence upon the amount of residual moisture in loam soils at the beginning of permanent wilting. Usually about one-half of the soil moisture between the wilting coefficient and the hygroscopic coefficient was taken by the trees. It is thought probable that although the wilting coefficient is not the lower limit of available moisture, it is a better basis for comparing moisture properties of soils than is the hygroscopic coefficient.

A comparison of the evaporation losses from the surfaces of bare soils with the amount of water taken from the soil by plants showed that evaporation losses were extremely small portions of the total amounts of water lost from the soil. The direct evaporation losses were confined mainly to shallow depths of soil. Moisture below the upper 8 in. was lost at an extremely slow rate. The losses of moisture from the surfaces of soils exposed to evaporation for much longer periods of time than are usual between irrigations were insufficient to prohibit the growth to maturity of barley and vetch plants.

Cultivation did not influence the losses of moisture by evaporation from the bare surfaces of the soils in the tanks and in field plats, and did not materially influence the distribution of moisture in these soils. The loss of moisture by evaporation from the surfaces of soils immediately following the application of water was found to be a large portion of the total evaporation losses for a long period of time. About half of the loss in 80 days occurred during the first week after irrigation, and the greater amount of this was lost before the soil was in condition to be properly cultivated.

After the water applied to the soil had become distributed, the movement of moisture by capillarity was found to be extremely slow. The movement of moisture from moist soils to dry soils packed in columns and remaining in contact with each other for 4.5 months was slight in amount and extent in both an upward and downward direction. The results indicate that the capillary movement of moisture from moist soil to drier soil, when the soil is not in

contact with a free water surface, is too limited in extent and probably in rate to be effective for use by plants.

Run-off water losses in relation to crop production (*Texas Sta. Rpt. 1926, pp. 42, 43*).—In a progress report of this work it is stated that the results thus far indicate that a large amount of water is lost by run-off from Texas soils, and that the intensity of the rainfall, the percentage of water in the soil, the condition of the soil, the crop on the land, and the type of obstruction are all important factors in this connection.

Surface water supply of the Great Basin, 1922 (*U. S. Geol. Survey, Water-Supply Paper 550 (1927), pp. V+192, pls. 2*).—This report, prepared in cooperation with the States of Idaho, Utah, Nevada, California, and Oregon, presents the results of measurements of flow made on streams in this basin during the year ended September 30, 1922.

Public Roads, [April, 1927] (*U. S. Dept. Agr., Public Roads, 8 (1927), No. 2, pp. 21-40+[2], figs. 28*).—This number of this periodical contains data by States on the gasoline taxes for the year 1926 and the status of Federal-aid highway construction as of March 31, 1927, together with the following articles: Landslides and Their Relation to Highways, Part 1, by G. E. Ladd; Standard Sizes of Crushed Stone, by F. H. Jackson; and Motor Vehicle Registration and Revenue, 1926, by L. A. Abbot.

The use of models in the solution of indeterminate structures, G. E. Beggs (*Jour. Franklin Inst., 203 (1927), No. 3, pp. 375-386, figs. 8*).—In a contribution from Princeton University the methods and apparatus used in the study of indeterminate structures are described and illustrated. The use of similar methods and apparatus in the solution of indeterminate barn roof trusses seems possible.

The expansion of Portland cement mortar bars during disintegration in sulphate solutions, T. Thorvaldson, R. K. Lamour, and V. A. Vigfusson (*Engin. Jour. [Canada], 10 (1927), No. 4, pp. 199-206, figs. 9*).—Studies conducted at the University of Sackatchewan as a further contribution to the deterioration of concrete in alkali soils are reported. A comparison was made between the contraction and expansion of Portland cement mortar bars when alternately dried and wetted in water and in sulfate solutions. It was found that the expansion method for studying sulfate action on concrete has very marked advantages when the action progresses very slowly and the experiments last for months or years.

It was brought out that, although the time of curing is an important factor affecting expansion of mortar bars in sulfate solutions, comparisons of bars cured the same length of time, whether for one week or more, give similar results, and after one month the effect of time of curing is very slight.

Comparisons of the expansion of mortar bars in sulfate solutions were found to be not permissible when the ratio of amount of mortar to amount of solution varies. The effect of richness of mixture on expansion of mortar bars was found to be somewhat greater in the case of solutions of magnesium sulfate than with solutions of sodium sulfate, the difference between the number of days required for equivalent expansion of 1 to 5 and 1 to 3 bars being greater than in the case of sodium sulfate.

For solutions of both salts the effect of concentration above molar on expansion was found to be almost negligible, and between molar and 0.5 molar very slight. For solutions of lower concentration the effect was more marked, and below 0.05 molar the slowing down of the rate of expansion was especially marked in solutions of sodium sulfate. The expansions in saturated solutions of the two salts were found to be nearly identical. The same applies to 1.0 molar

solutions, but below this concentration there is a marked difference. For solutions of magnesium sulfate the time required for a given expansion in the most dilute solution used was a little over twice that required to produce the same expansion in a saturated solution. In the case of the corresponding solutions of sodium sulfate the dilute solution required about five times as much time as a concentrated one for equal expansion. The lower limit of concentration which causes 1 to 5 mortar to disintegrate fairly rapidly is commonly found in the seepage water in shallow wells on the central prairie.

With sodium sulfate solutions it was found that each increase of 10° C. (50° F.) in the temperature reduced the time necessary for equivalent expansion by about one-third, with a slight tendency to a decrease in the reduction as the temperature rises. The effect of temperature for solutions of magnesium sulfate between 0 and 22° was somewhat greater. There was a marked change in the action of this salt on the mortar, the bars expanding rapidly at first and then more slowly, without falling to pieces, until finally those kept at 0.5° showed a greater expansion than those kept at 40°.

The percentage of mixing water used was found to have a very marked effect on the expansion of mortars in sulfate solutions.

High silicon structural steel, H. W. Gillett (*U. S. Dept. Com., Bur. Standards Technol. Paper 331 (1926), pp. 121–143, figs. 10*).—The results of tests on specimens of Freund steel are presented, showing it to combine the desirable properties of high yield point and high ductility. The steel is unusually high in silicon, containing about 1 per cent, and low in carbon, containing less than 0.15 per cent. Published data on the alloying effect of silicon and of manganese are summarized, and specifications for the high silicon steel are presented.

A consolidation of field reports on the combine reaper-thresher in Saskatchewan, compiled by G. F. Boyd (*Saskatchewan Dept. Agr. Bul. 78 (1926), pp. 15, figs. 3*).—The results of field tests are summarized.

Where suitable conditions exist for the operation of the combine the cost of handling grain is reduced considerably, as many operations are entirely eliminated. Short crops difficult to cut with a binder are handled more successfully with the combine. The use of the combine presents the disadvantage, however, that the grain must be left standing from 10 days to 2 weeks longer than if cut by a binder. Because of excessive moisture in the threshed grain it may be difficult to store it without heating and consequent depreciation. There was found to be a loss due to incomplete separation from the straw when unripe portions of a field are harvested. The opinion is expressed that the combine should prove especially useful to handle early matured crops such as have occurred in certain years in the southwestern and west-central parts of Saskatchewan.

Housing farm poultry, L. E. Card and W. A. Foster (*Illinois Sta. Circ. 315 (1927), pp. 20, figs. 23*).—Practical information on the planning and construction of poultry houses under Illinois conditions is given, together with specifications and plans of structures and bills of material.

Water systems for farm homes, F. D. Cornell, Jr. (*West Virginia Sta. Circ. 44 (1927), pp. 24, figs. 14*).—Practical information on the planning and installation of water systems for West Virginia farm homes is given.

Modern methods of sewage disposal, W. Butler and J. H. Coste (*Jour. Soc. Chem. Indus., 46 (1927), No. 6, pp. 49T–59T*).—A summary of knowledge on the subject is presented.

Ventilation in trickling filters, A. M. Buswell and A. L. Elder (*Pub. Works, 58 (1927), No. 4, pp. 154–156, fig. 1*).—Studies conducted by the State Water Survey of Illinois are reported which showed that ventilation in trickling filters is not always obtained by the downward flow of air through the filters

but can be obtained as well by upward movement. Calculations indicate that air may easily move with such velocity in trickling filters that the loss of oxygen in the air, caused by the biochemical oxygen demand of the sewage in its passage through the trickling filter, is within the observational error of the oxygen determination.

Analyses of the air in filters constructed with an adequate drainage system, but having no special provision for ventilation, failed to show a significant depletion of oxygen.

Distribution of cellulose in Imhoff tanks, H. Heukelekian (*Pub. Works, 58 (1927), No. 4, pp. 133–135, fig. 1*).—Studies conducted at the New Jersey Experiment Stations are reported which showed that fresh sewage solids collected from the inlet end of an Imhoff tank have a relatively high cellulose content. The cellulose content is not only higher due to higher solids concentration, but it forms a higher percentage of the solids themselves. A long flow chamber therefore affects solids concentration and the chemical composition of the solids, due to the difference in settleability of the different components. It was found that in a tank which is shallow and long there will be an uneven quantitative and qualitative distribution of solids, while if the tank is built for the same capacity but deep the distribution of solids will be more uniform.

RURAL ECONOMICS AND SOCIOLOGY

Correlation theory and method applied to agricultural research, B. B. Smith (*U. S. Dept. Agr., Bur. Agr. Econ., 1926, pp. [3]+102, figs. 3*).—This mimeographed article brings together and coordinates in a form adapted to reference purposes the theory and methods of correlation as applied to agricultural research and the statistical methods developed by the staff of the Bureau of Agricultural Economics. The new subject matter includes multiple linear and curvilinear correlation, joint relationships, application to time series, and apportionment of importance to contributing variables. The method of approach to the subject is essentially that used in the Graduate School of this Department during the past two years.

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bul. 402 (1927), pp. 103–109*).—Results of investigations are reported as follows:

Feed and other requirements for pork production.—The average cost of producing 100 lbs. of marketable pork for the period 1920–1924, as shown by the results of cost accounts kept on 20 Greene County farms, was $9.72, divided as follows: Feed and pasture $7.21; man labor $1.15; horse labor 11 cts.; veterinary 28 cts.; buildings and equipment 31 cts.; and overhead, taxes, insurance, and interest 66 cts.

Depreciation on dairy cows.—Records kept on 70 farms in Medina County for 1920–1924 show the annual depreciation per head to have varied from $4.69 to $21.52, averaging $9.96. Nineteen per cent of the cows at the beginning of the year were sold, 5 per cent condemned for bovine tuberculosis, 2 per cent butchered on the farm, and 2 per cent died.

How livestock are marketed from Ohio.—This study of the disposal of livestock during the year 1925 shows 48.1, 37.1, 47.2, and 90 per cent, respectively, of hogs, cattle, calves, and sheep were shipped to terminal markets; 27.3, 14.8, 25.2, and 6.5 per cent, respectively, sold direct to packers; 19.1, 16.8, 3.5, and 2.2 per cent, respectively, killed on the farm; and 5.5, 31.3, 24.1, and 1.3 per cent, respectively, sold to local butchers.

[*Cost of family living on farms*].—Reports from 26 farm families in 9 counties for the year beginning April 1, 1924, show the expenditures per

family varied from \$495.95 to \$3,998.10, averaging \$1,407.02. The percentage of the total furnished by the farm varied from 11 to 54.6, averaging 29.1. A table is given showing for each family and by groups the percentage of the expenditures for different purposes.

Relation of tax value to sales value of farm land.—A study of 379 sales made between July, 1925, and July 1, 1926, in 5 counties shows that the appraised value for taxation purposes was 81.3 per cent, varying from approximately 70.1 to 88.2 per cent in the different counties. The average tax valuation in these counties varied from \$21.22 to \$82.23 per acre on land and from \$3.84 to \$21.81 on buildings, averaging \$47.02 and \$12.76, respectively.

Factors that influence profits on irrigated farms, L. A. Moorhouse, R. T. Burdick, and J. B. Hutson (*Colorado Sta. Bul. 318 (1927), pp. 49, figs. 28*).—The results are given of a study by the route method of about 25 farms in the irrigated districts of northern Colorado during the years 1922–1925. Data as to man labor, horse work, seed, and fertilizer and other materials used in crop growing; the feed, man labor, horse work, and miscellaneous cash cost in producing livestock and livestock products; and the crop yields and livestock production were obtained for from one to four years on the several farms. The work was done in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

The most outstanding factors affecting returns were found to be the selection of the enterprises, cost and utilization of man labor and horse work, crop yields and cropping practices, feeding practices, knowledge of values, adjustments in farm plans due to price changes, size of business, and managerial ability. Four of the five farms with the highest net returns had from 40 to 60 per cent of the crop area in cash crops (beets, potatoes, beans, and wheat), from 30 to 35 per cent in alfalfa, and from 8 to 12 per cent in barley and oats, as compared with an average of 32.8, 38.2, and 5.4 per cent, respectively, for the 25 farms. On all four of these farms, lambs or cattle or both were fed each year. Effective utilization of regular farm labor had a marked effect on returns. Horse work cost on an average 12.3 cts. per hour on the five most profitable farms and 17 cts. per hour on the five least profitable. On the former the horses averaged 1,124 hours' work per year, 20.4 acres being handled per horse, as compared with 674 hours' work and 13.9 acres on the latter. Crop yields and practices, feeding practices, managerial ability of the operators, size of business, etc., in their relation to returns are analyzed for the several farms.

Short-term farm credit in Texas, V. P. Lee (*Texas Sta. Bul. 351 (1927), pp. 25*).—This analysis of the short-term credit situation is based upon the replies of 661 farmers to a questionnaire and information received from 52 banks and 279 merchants.

Four hundred and fifty-five farmers, mainly cotton farmers, of whom 70 per cent were owners, 7 per cent part owners, and 23 per cent tenants, reported receiving credit to the average amount of \$751 in 1925. Of the borrowers, 83 per cent received all or a part of their credit from banks, 52 per cent all or a part from merchants, and 17 per cent received credit from individuals. Bank loans averaged \$583, the average term being about 6 months, and the rate of interest 10 per cent on loans of less than \$100 and 9.5 on loans of over \$100. In addition, about 62 per cent of the loans were discounted. About 26 per cent of the total loans were on unindorsed and unsecured notes and 16 per cent on indorsed notes. About 56 per cent of the bankers reported farmers prompt in meeting their obligations, and the average loss on such loans from January 1, 1921, to July 1, 1925, was 0.6 per cent. About 40 per cent of the amount loaned to farmers was used for consumption purposes and 60 per cent for production

The average merchant credit received by farmers was $472 in 1924 and $381 up to September 1, 1925. About 50 per cent of the credit was on open account, 13 on personal notes, 6 on indorsed notes, and 31 per cent on secured loans. About 62 per cent of the merchants charged interest, the average annual rate being about 12 per cent. About 10 per cent of the merchants charged higher prices on credit sales, the higher price being equivalent to an annual rate of 13 per cent. Approximately 28 per cent of the 1924 accounts were carried over to 1925, and about 3.1 per cent were finally lost. Only about 3 per cent of the farmers reporting were required to sell their products to the creditor merchants. About 4 per cent of the farmers receiving credit obtained part or all from their landlords and 13 per cent from other individuals, the average amounts being $112 and $628, respectively. The loans from landlords ran for an average term of 7.4 months at an average of 9.1 per cent, and those from individuals averaged 14.4 months at 8.9 per cent interest.

The study shows that too much credit is being used for consumption purposes, that merchant credit is very expensive to both the farmer and the merchant, and that bank rates of interest are apparently excessive.

Report on agricultural credit, R. R. Enfield (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 8 (1926), pp. 104*).—In this, the eighth of this series of reports, the problem of capitalization in the agricultural industry, the need for credit, existing credit facilities, and short-term credit in the United States are discussed. It is recommended that (1) short-term credit be concentrated in the hands of the banks with either a form of chattel mortgage on certain classes of farm produce, or a floating charge upon the liquid assets of a farm or cooperative marketing society, either of which would take priority to all other charges except rent, rates, and taxes; (2) a central bankers' register of chattel mortgages or floating charges be established open to bank but not public inspection; (3) the mortgagor be left free to dispose of such mortgaged produce but be required to notify the bank of its sale and apply the proceeds on the debt; (4) procedure under section 2 of the Agricultural Credits Act of 1923 be so changed that agricultural credit societies, instead of borrowing money from the State, should indorse members' notes for discount at banks; and (5) a central land bank be established and empowered to issue debentures secured by first mortgages on agricultural land and buildings, to make loans on land through joint-stock banks, and to handle intermediate credit connected with land improvements.

The Iowa agricultural outlook for 1927, C. L. Holmes (*Iowa Sta. Cur. Econ. Ser. Rpt. 5 (1927), pp. 24, fig. 1*).—A discussion and interpretation of the report previously noted (E. S. R., 56, p. 888) in its bearing upon the agriculture of Iowa.

Report on wool marketing in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 7 (1926), pp. 66, pls. 8, figs. 2*).—This report of the seventh of the series discusses the variations in production, price movements, preparation for market, assembling the produce, central markets, and the cooperative organizations of producers. Appendixes give statistics on production, exports, and consumption of wool; conditions governing sales at central auctions; and examples of railway rates for raw wool.

Report on egg marketing in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 10 (1926), pp. VI+153, pls. 24, figs. 4*).—This report discusses the existing supplies and prices, quality points, preparation, assembling, transportation, distribution, and conservation of eggs, and the types of cooperative egg-marketing organizations in England, Belgium, Netherlands, and Norway. Recommendations are made for educational work, legislation, and

cooperative work on the part of producers and distributors to improve conditions of the industry.

Report on the marketing of potatoes in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 9 (1926), pp. VI+107, pls. 16*).—This report considers the supplies and prices, assembling, grading, standardization, packing, transportation, wholesaling, retailing, and storage of the potato crop of England and Wales. The problems of processing the surplus production, the present and possible cooperative organizations of producers, and the seed trade are discussed.

Demand, marketing, and production of Oregon and Washington prunes, B. H. Critchfield (*U. S. Dept. Agr., Dept. Circ. 416 (1927), pp. 48, figs. 9*).—The purpose of this study was to obtain and analyze the economic facts regarding the prune industry of the two States as an aid to planning better production and marketing programs. A census was made of trees, yields, production, etc. Approximately 350 wholesale agencies, 700 retail store managers in 29 selected markets, and more than 800 housewives were interviewed. The market demand for prunes and the factors affecting such demand; the acreage, production, distribution, and marketing of Oregon and Washington prunes; the prices received by and the cash expenses of growers in these States; the present status of the industry in the two States; and the possibilities of future competition and other problems confronting the industry are discussed.

Profitable farm organizations for the Coastal Plain of North Carolina, G. W. Forster, R. J. Saville, and J. B. Hutson (*N. C. Agr. Col., Bur. Econ. and Social Research Bul. 1 (1926), pp. 33, figs. 8*).—This bulletin is based upon a study of 26 representative farms made in cooperation with the Bureau of Agricultural Economics, U. S. D. A. Inventories as of March 1, 1924 and 1925; a farm map; a 5-year crop history; daily records of receipts, expenditures, and labor distribution; and monthly statements of feed for different classes of livestock and of farm products used in the home were obtained for each farm. With these data as a basis, plans are outlined for organizing and operating a 30-acre, a 50-acre, and an 80-acre farm.

The demographic and economic basis of political radicalism and conservatism, G. A. Lundberg (*Amer. Jour. Sociol., 32 (1927), No. 5, pp. 719–732*).—This is the report of a study of five radical and five conservative counties each in North Dakota and Minnesota, the classification being based on the support of or opposition to the Nonpartisan League in the elections of 1916 to 1924. The data available were scarce and from secondary sources, mainly the United States census. As a whole, the radical counties in both States were found to have a young, foreign immigrant, rural population occupying the newer and less developed parts of the States, as compared with a comparatively old, native, urban population in the conservative counties. The economic circumstances and prosperity in the radical counties were also found to be uniformly inferior to those of the conservative counties.

The rural mind: A study in occupational attitude, W. C. Smith (*Amer. Jour. Sociol., 32 (1927), No. 5, pp. 771–786*).—The causes of the difference between the characteristic socio-psychic traits or habitual ways of response of rural and urban dwellers are considered from the points of view of selection, isolation, domestication, and occupation. The occupational activities are fundamental in the development of attitudes, and the differences between rural and urban groups may be largely accounted for by the differences in occupational conditions.

FOODS—HUMAN NUTRITION

Foods, F. S. Aumonier (*Soc. Chem. Indus.* [*London*], *Ann. Rpts. Prog. Appl. Chem., 11* (*1926*), *pp. 542–565*).—This literature review for 1926 includes sections on vitamins and nutrition, milk and dairy products, fruit and vegetable products, preservatives and coloring matter, cereal products, and miscellaneous. Many references to the literature are given as footnotes.

What's best to eat? S. H. Belfrage (*New York: William Wood & Co., 1926, pp. XI+199, pls. 2*).—A nontechnical discussion of the essentials of nutrition, with a foreword by E. V. McCollum and a practical supplement by L. H. Yates containing a collection of "suggestive recipes as examples of the way in which food materials of the right kind can be combined so as to provide attractive and wholesome dishes."

A biochemical survey of bread production, C. H. Bailey (*Amer. Food Jour., 22* (*1927*), *No. 4, pp. 128–130*).—A brief discussion of the biochemical problems involved in bread production, from the growth of the wheat to the finished loaf.

Vegetables: Arracacha, breadfruit, cassava, leren, malanga, E. M. Willsey (*Porto Rico Univ., Dept. Home Econ. Bul. 1* (*1926*), *pp. 32*).—This is a continuation of the series of bulletins on standardized recipes for tropical foods (E. S. R., 55, p. 291).

The nutritive value of the mung bean, H. H. M. Bowman and M. A. Yee (*Mich. Acad. Sci., Arts, and Letters, Papers 6* (*1926*), *pp. 181–188, pl. 1, fig. 1*).—Included in this paper are analyses of mung beans, the figures for which are stated to be "only the bulked averages of the various nutrients and constituents. Individual samples of these beans vary with the locality from which they are secured." The proximate composition is given as protein 24.76 per cent, sugar and starches 50.41, cellulose 4.19, fats 1.5, salts 3.8, and water 11.5 per cent; the distribution of carbohydrates as starch 2.26 per cent, dextrin 6.49, pentosan 5.34, cellulose 4.19, organic acids 1.69, and sucrose 0.90 per cent; and of ash constituents as ash in dry substance 3.80 per cent, potassium 16.3, sodium 3.30, calcium 16.15, magnesium 4.45, iron 4.80, phosphorus 6.77, sulfur 0.413, and silicon 0.736 per cent.

A few feeding experiments with guinea pigs are reported, from which the authors conclude that the mung bean resembles other beans, with the possible exception of soy beans, in its protein deficiencies, but that it is superior to most beans, including the soy bean, in its mineral salts. As noted in previous studies (E. S. R., 53, p. 503), it is rich in vitamin B.

The soybean as human food, A. A. Horvath (*Chinese Econ. Mo., 3* (*1926*), *Nos. 9, pp. 392–400; 11, pp. 513–518; Chinese Econ. Jour., 1* (*1927*), *Nos. 1, pp. 24–32; 2, pp. 175–192; 3, pp. 298–309; 4, pp. 415–425*).—Included in this compilation of information on the food possibilities of the soy bean are analyses of many varieties of Manchurian soy beans and of soy bean curd and various soy bean sauces.

The effect of the use of salt in cooking vegetables (*Ohio Sta. Bul. 402* (*1927*), *p. 100*).—It is briefly reported that the addition of chemically pure sodium chloride in amounts suitable for seasoning to water in which vegetables were cooked did not appear to change the color of the vegetables studied, which included representatives of green leafy vegetables, root vegetables, legumes, tubers, and seed pods. The texture and the flavor of the vegetables were considered best when the salt was added at the beginning and poorest when added at the end of the cooking period. There appeared to be little correlation between the percentage loss of ash from the various vegetables and the time at which the salt was added.

The chloride content of canned sauerkraut, M. E. STARK (*Jour. Lab. and Clin. Med., 12 (1927), No. 6, pp. 561–563*).—Determinations of the content of chlorides, calculated as NaCl, in canned sauerkraut are reported.

The minimum, maximum, and average values for the juice as determined on 11 samples, including 8 brands, were 1.502, 2.228, and 1.881 gm. per 100 cc. and 1.469, 2.167, and 1.83 gm. per 100 gm., respectively. Corresponding values in grams per 100 gm. for solid kraut representing 7 samples from 5 cans and including 4 brands, were 1.605, 1.947, and 1.736 gm., respectively.

Preserving fruits and vegetables in the home, E. W. HAMILTON (*Canada Dept. Agr. Bul. 77, n. ser. (1927), pp. 46, figs. 13*).—This bulletin follows the general plan of Bulletin 93 (E. S. R., 43, p. 316), of which it is a revision.

Preservation of Philippine foods, M. Y. OROSA (*Philippine Bur. Sci. Pop. Bul. 1 (1926), pp. III+32*).—A popular bulletin on canning and preserving, with special directions for canning and making jams, jellies, preserves, and pickles from native Philippine fruits and vegetables.

Sugar as a source of the anaerobes causing explosion of chocolate candies, J. WEINZIRL (*Jour. Bact., 13 (1927), No. 3, pp. 203–207*).—The bacteriological analysis of 33 samples of sugar of various kinds has shown the presence of anaerobes in 85 per cent of the samples. The organisms were found to be of five types, three of which were identified as *Clostridium sporogenes*, *C. putrificum*, and *C. aerofetidum*. It is concluded that sugar furnishes a ready source of the anaerobes causing the occasional explosion of chocolate candies, as noted in an earlier paper and confirmed by Hill (E. S. R., 54, p. 191).

The milk of Australian women, H. S. H. WARDLAW and E. E. P. DART (*Aust. Jour. Expt. Biol. and Med. Sci., 3 (1926), No. 3, pp. 129–147, figs. 4*).—This paper supplements an earlier one (E. S. R., 35, p. 557) in which analyses were reported of the milk of Australian women during the early stages of lactation. The data in the present paper are on the composition and certain constants of milk obtained between the first and ninth months of lactation.

The modal values for this period were for depression of the freezing point 0.0583° C., lactose 6.45 per cent, sp. gr. 1.0296, protein 1.40 per cent, ash 0.19 per cent, and fat 5.30 per cent. These figures were in ascending order of the variability or dispersion of the quantities, which ranged from 0.0052 for the depression of freezing point to 0.195 for the percentage of fat.

"The average percentages of protein and of ash and the depression of freezing point show a slight fall as lactation continues. The average percentage of lactose shows a slight rise. The milk of the younger women is on the average distinctly richer in fat than that of the older women. The average volume of milk obtained from the breast varies in the opposite direction with age. The average percentage of ash is slightly greater in the milk of the younger women, while the average percentage of lactose varies in the opposite direction. The milk of the women between the ages of 22 and 27 has a distinctly greater average of depression of freezing point and smaller average percentage of protein than in the case of other age groups. The average volume of milk obtained from the breast increases with the number of lactations up to the fourth. The average percentage of fat decreases, so that the average weight of fat obtained remains constant."

Growth experiments on diets rich in fat, H. LEVINE and A. H. SMITH (*Jour. Biol. Chem., 72 (1927), No. 1, pp. 223–238, figs. 2*).—In this study, two out of three series of young rats grew at a normal or slightly above normal rate from 30 to 180 gm. in body weight on a ration practically devoid of preformed carbohydrate and containing 86 per cent of the total calories as fat, together with sufficient protein and salt. The failure of one group to grow

normally on this ration is attributed to some "inexplainable disturbing factor—perhaps hereditary in nature." The favorable results obtained are at variance with those reported by Smith and Carey (E. S. R., 51, p. 263), but in harmony with the conclusion of Osborne and Mendel previously quoted (E. S. R., 51, p. 557).

The high fat diet proved as efficient for growth in terms of calories as the more usual diet containing more carbohydrates and less fat, and the large amount of fat was utilized to the extent of 98 to 99 per cent.

Food for the diabetic, M. P. HUDDLESON (*New York: Macmillan Co., 1926, 2. ed., rev., pp. [XIII]+83, figs. 6*).—A revision of this practical handbook for diabetic patients dealing in simple language with the principles of the dietetic treatment of diabetes, methods for calculating diabetic diets, diabetic recipes, and directions for the examination of urine for sugar and for the hypodermic administration of insulin.

Sulfur metabolism, M. KAHN and F. G. GOODRIDGE (*Philadelphia: Lea & Febiger, 1926, pp. XIV+17-831, figs. 2*).—In this exhaustive monograph the literature on the various phases of the subject is reviewed chronologically, with a bibliography at the end of each section. The chapters on the sulfur content of foods and of body tissues, fluids, and excretions, on sulfur metabolism in health and disease, and on methods of determining sulfur in foods, feces, and urine should be of particular interest to readers of this section.

The metabolism of sulfur.—XI, Can taurine replace cystine in the diet of the young white rat? G. T. and H. B. LEWIS (*Jour. Biol. Chem., 69 (1926), No. 2, pp. 589–598, figs. 2*).—In continuation of the series of studies previously noted (E. S. R., 56, p. 14), an attempt was made to determine whether taurine or cysteinic acid, a product intermediary between taurine and cystine, is capable of replacing cystine in the nutrition of young rats. Two types of basal low cystine diets were used, but with neither of these was there any growth response on the addition of taurine or cysteinic acid. These results are contrary to those reported by Mitchell (E. S. R., 51, p. 767), but confirm those reported by Beard (E. S. R., 55, p. 292) for white mice.

The availability of taurine as a supplementing agent in diets deficient in cystine, W. C. ROSE and B. T. HUDDLESTUN (*Jour. Biol. Chem., 69 (1926), No. 2, pp. 599–605, figs. 2*).—Further evidence that taurine is incapable of replacing cystine in the nutrition of rats, as noted above, is presented in data from feeding experiments repeating with rats the experiments of Mitchell on mice.

Iron in nutrition.—IV, Nutritional anemia on whole milk diets and its correction with the ash of certain plant and animal tissues or with soluble iron salts, E. B. HART, C. A. ELVEHJEM, J. WADDELL, and R. C. HERRIN (*Jour. Biol. Chem., 72 (1927), No. 1, pp. 299–320, fig. 1*).—In this continuation of the series of studies on iron in nutrition (E. S. R., 57, p. 92), it has been demonstrated that the ash of materials which had previously been found to be effective in the prevention of anemia in rabbits on a whole milk-Fe_2O_3 diet is likewise effective. This would indicate that, contrary to the opinion previously expressed, the preventive factor is of inorganic rather than organic character.

The materials proving particularly effective were the ash of lettuce, the ash of cabbage, and the ash of an alcoholic extract of cabbage. The ash of corn grain was not particularly effective, nor was the ash of spleen marrow. In preparing the ashes, the materials were heated for 20 to 30 minutes in an electric muffle at a temperature of 650 to 750° C.

In discussing the significance of these results, particularly with reference to the conflicting literature on the utilization of inorganic iron in hemoglobin

building, attention is called to the differentiation between soluble and insoluble iron salts recently brought to the front again by Mitchell and Schmidt (E. S. R., 56, p. 494). The authors are of the opinion that the more favorable results obtained by Mitchell and Schmidt with ferrous sulfate than with ferric oxide may have been due to an impurity in the ferrous sulfate, since they have found that impure soluble $FeSO_4.7H_2O$ (although labelled C. P.) was effective and a highly purified preparation less effective. The necessity of working with highly purified soluble iron salts is emphasized.

The effect of zinc administration upon reproduction and growth in the albino rat, together with a demonstration of the constant concentration of zinc in a given species, regardless of age, P. K. Thompson, M. Marsh, and K. R. Drinker (*Amer. Jour. Physiol., 80 (1927), No. 1, pp. 65–74, figs. 2*).—The feeding of organic zinc salt solutions (acetate, citrate, and malate) or of zinc oxide suspensions in doses of from 2 to 38 mg. daily, not only for weeks previous to mating but during pregnancy and lactation, has no significant effect upon the health of the parents nor upon the health and early growth of the offspring. The average zinc concentrations of newborn, 60-day-old, and adult albino rats are 0.038, 0.039, and 0.04 mg., respectively, of zinc per gram of tissue. Heavy feeding of zinc has practically no effect upon the total concentration of zinc in the albino rat. If there is an unusual storage it has no effect upon the health of the animal, and the amount stored is very small.

The normal excretion of zinc in the urine and feces of man, K. R. Drinker, J. W. Fehnel, and M. Marsh (*Jour. Biol. Chem., 72 (1927), No. 1, pp. 375–383, fig. 1*).—The limited literature on zinc metabolism in human subjects is reviewed, and data are presented on the content of zinc in 50 24-hour specimens of urine and of feces from normal adults on an ordinary mixed diet and from 2 more subjects for 8 consecutive days, upon 1 day of which the food was especially selected to increase the zinc content as much as possible.

The minimum, maximum, and average figures for the 24-hour specimens were 0.25, 2, and 0.89 mg., respectively, for the urine and 2.67, 19.9, and 9.8 mg. for the feces. The high zinc meal, containing an estimated amount of from 225 to 275 mg., caused a marked increase in the fecal zinc but no significant change in the urinary zinc for the 24 hours immediately following.

The technique of vitamin assay (*Nature [London], 119 (1927), No. 2988, pp. 216, 217*).—A review of recent literature on the technique of determining vitamins A and D, including color tests for A.

Biological value of a standard yeast extract utilized as a source of water-soluble B [trans. title], L. Randoin and R. Lecoq (*Jour. Pharm. et Chim., 8. ser., 5 (1927), No. 4, pp. 147–154, figs. 4*).—The authors have tested the value of an American standard yeast extract (presumably Harris yeast vitamin) in curative and preventive tests with pigeons on the synthetic diet previously described (E. S. R., 56, p. 393).

In the preventive tests, doses of 0.05 and 0.1 gm. daily prolonged only slightly the survival period, about 0.4 gm. being necessary for noticeable results. In the curative tests even this amount was of little effect. This is thought to indicate that the yeast extract contains very little of the antineuritic factor but more of what is termed the maintenance or functioning fraction of vitamin B. The authors call attention to a recent paper of Seidell (E. S. R., 56, p. 203) in which the rat is recommended as the animal of choice in vitamin B experiments, and state that in their opinion the pigeon is preferable on account of greater sensitiveness. They criticize moreover the customary use of the term standard as applied to yeast extracts without specifying exactly the conditions under which the extract is to be used.

Qualitative and quantitative studies on the water-soluble vitamin B in yeast extracts, yeasts, and the culture media of these yeasts [trans. title], L. Randoin and R. Lecoq (*Jour. Pharm. et Chim., 8. ser., 5 (1927), No. 5, pp. 193–208, figs. 18*).—To demonstrate that yeasts differ in their content of vitamin B, depending upon the culture medium on which they are grown, a comparative study is reported of two yeasts, both belonging to the species *Saccharomyces cerevisiae* and having similar morphological and chemical characteristics. One of the varieties was a bottom yeast cultivated on beer wort prepared with hops and malt and the other a top yeast used in a distillery and cultivated on diluted beet molasses. In all the tests reported pigeons were used for determining the vitamin B content of the material by preventive and curative tests.

The brewery yeast dried at 50° C. was able to prevent or cure polyneuritis in amounts of 0.5 gm. daily, while the distillery yeast dried in the same manner retarded polyneuritic symptoms only slightly in 0.75 gm. daily doses, prolonged life only about 20 days in 1 and 1.5 gm. amounts, and was ineffective in curative tests.

An extract of brewery yeast prepared by successive treatments with 70 per cent alcohol prevented polyneuritis in 0.1 gm. daily doses and cured it in amounts of 0.2 gm. With a similar extract of distillery yeast the survival period increased with increasing dosage, but sudden death from polyneuritis occurred in from 25 to 40 days on 0.1 gm. and in from 65 to 70 days on 0.2 gm. In curative tests from 0.15 to 0.2 gm. prolonged life for from 24 to 26 days, 0.4 gm. for 40, and 0.5 gm. for 100 days, followed in each case by an abrupt appearance of symptoms and sudden death.

Dry hops and molasses were without effect as sources of vitamin B, but malt as the sole source of carbohydrate and vitamin B prevented and cured polyneuritis.

The difference in the antineuritic vitamin content of the two yeasts is attributed to the difference in composition of the medium in which the yeast was grown. Attention is called to individual differences in the behavior of pigeons and the necessity for using several for each test.

Experimental studies on the sensitivity of water-soluble B vitamins to drying [trans. title], L. Randoin and R. Lecoq (*Bul. Sci. Pharmacol., 34 (1927), No. 3, pp. 129–138, figs. 9*).—Following their customary technique, the authors have studied the stability of vitamin B on drying in air at 50° C. and on vacuum drying at low temperature by testing the various products on both rats and pigeons.

Distillery yeast and brewery yeast dried in the air at 50° and fed in amounts of 0.75 gm. daily proved capable of sustaining growth in rats, promoting reproduction to a slight extent, and sustaining growth of the second generation, but not of producing a third generation. Distillery yeast dried at 50° when fed to pigeons in amounts of 1.5 gm. daily prolonged life for only about 20 days in preventive experiments and was without effect in curative. Fresh distillery yeast in amounts of 3 gm. daily prolonged life for 60 days and in amounts of 4 gm. (corresponding to 1.25 gm. of dried yeast) prolonged life indefinitely. Distillery yeast dried rapidly in vacuum at low temperature was as effective as fresh yeast.

Only 0.1 gm. of an alcoholic extract of fresh brewery yeast was required in preventive and 0.2 gm. in curative tests, but 0.15 gm. of an extract prepared in the same way from yeast dried at 50° was entirely inactive.

These results are thought to furnish additional proof of the presence in yeast of two factors, one of which (the antineuritic vitamin) is less stable to heat than the other.

On the content of vitamin C in Japan sand pear (Pyrus serotina, Rehder), kaki (Diospros kaki L.), and Satsuma orange (Citrus unshiu) [trans. title], Y. IWASAKI (*Jour. Okitsu Hort. Soc., No. 22 (1927), pp. 1–10, figs. 4; Eng. abs., pp. 9, 10*).—In the English summary of this Japanese report, it is stated that 45 cc. of the juice of the flesh of the Japan sand pear does not suffice to cure guinea pig scurvy, but that a slightly smaller amount of the juice of the entire pear containing the rind cures scurvy in 40 days. The ripe kaki fruit in amounts of 10 cc. daily is said to cure scurvy completely in 30 days and the Satsuma orange in amounts of 4 to 5 cc. daily in 50 days.

In the experiments reported the basal diet consisted of equal volumes of wheat bran and rolled oats ad libitum, together with 40 cc. of milk autoclaved for an hour at 120° C.

Vitamin E: The ineffectiveness of curative dosage when mixed with diets containing high proportions of certain fats, H. M. EVANS and G. O. BURR (*Jour. Amer. Med. Assoc., 88 (1927), No. 19, pp. 1462–1465*).—Fertility data for rats on supposedly adequate diets containing ample vitamin E in the form of wheat embryo mixed with various fats or fatty acids are reported, demonstrating that lard, Crisco, and technical oleic acid when mixed with the sources of vitamin E render it ineffective. The possibility is suggested that in the high fat diets the vitamin is taken up by the fat and excreted with the unabsorbed fraction.

Sterols and antirachitic vitamin [trans. title], A. WINDAUS (*Chem. Ztg., 51 (1927), No. 12, pp. 113, 114*).—By means of repeated recrystallization of cholesterol from cholesteryl acetate and separation of the most difficultly soluble fraction, followd by repeated distillation of this fraction in high vacuum, the author has obtained a product resembling cholesterol in most respects, but differing from it in being more sensitive to oxidation, showing more intense absorption of ultra-violet light, and having a much more potent antirachitic action on activation than the original cholesterol. The substance appears to be identical with ergosterol, and a mixture of a vitamin-free cholesterol with 1/60 per cent ergosterol identical with unpurified cholesterol. The author is of the opinion that ergosterol is the provitamin which on irradiation is converted into the antirachitic vitamin. Confirming this, irradiated ergosterol has been shown to have a marked curative action for rachitic rats in doses of from 0.001 to 0.002 mg.

Antiricketic substances.—V, The action of ultra-violet rays on the ethers and esters of cholesterol, C. E. BILLS and F. G. McDONALD (*Jour. Biol. Chem., 72 (1927), No. 1, pp. 13–19*).—In this continuation of the chemical studies on antirachitic substances (E. S. R., 56, p. 11), 14 ethers and 4 esters of cholesterol were irradiated and tested for antirachitic properties by the McCollum line test, the material to be tested being incorporated in seal oil solution on the McCollum basal diet 3143 at a level of 0.5 per cent. In commenting on this diet, it is stated that failure to secure satisfactory rickets with its use generally indicates faulty environmental conditions or abnormal conditions in the breeding stock. The substitution of hard whole wheat meal (Pillsbury's 100 per cent flour) for the soft wheat of the original diet is recommended. In the author's experience normal rats 24 days of age develop severe rickets in 18 days on this diet when kept in a darkened room at 25°±3° C.

Of the esters tested, the acetate, isobutyrate, and benzoate were activated by irradiation, but the cinnamate was not. None of the ethers became antirachitic on irradiation.

These results are thought to indicate that in the activation of sterols both the double bond and the alcohol group are involved, and that the former must be intact, but the latter may be replaced by certain acid radicals.

Infantile rickets: Treatment by intramuscular injection of a cod-liver oil concentrate, L. WILKINS and B. KRAMER (*Bul. Johns Hopkins Hosp., 40 (1927), No. 1, pp. 52–57*).—Case reports are given demonstrating the successful treatment of active rickets in two colored babies 9 months of age by intramuscular injections at weekly intervals of an ether solution of a concentrate of cod-liver oil in doses equivalent to 25 cc. of the oil. Under this treatment fresh calcification of the rachitic cartilage appeared within three weeks, and the changes in the concentration of calcium and inorganic phosphorus in the serum were identical with those previously observed following the oral administration of cod-liver oil.

Heliotherapy, A. ROLLIER, trans. by G. DE SWIETOCHOWSKI (*London and New York: Humphrey Milford, Oxford Univ. Press, 1927, 2. ed., pp. XXIV+318, figs. 273*).—Although this volume deals especially with the heliotherapy of surgical tuberculosis, it should be of interest as regards sunlight in the prevention and cure of rickets. Attention is called particularly to the chapters on climatology, dosage and technique, general characteristics of solar action, prophylaxis, and heliotherapy of nontubercular affections and a chapter on the supporting action of actinotherapy contributed by E. Amstad. An extensive bibliography is appended.

TEXTILES AND CLOTHING

Manufacturing tests of cotton of the white grades of the universal standards for American cotton, H. H. WILLIS (*U. S. Dept. Agr. Bul. 1488 (1927), pp. 30, figs. 19*).—Spinning tests were conducted in cooperation with Clemson Agricultural College to determine the relative intrinsic value of each of the nine white grades (E. S. R., 50, p. 639) of American upland cotton, all grades being run under similar mechanical and moisture conditions.

The average percentages of visible waste from the nine grades of cotton ranged from 5.5 per cent on grade No. 1 to 14.44 per cent on grade No. 9. While the strength of the yarn did not always follow the grade of cotton, there was a tendency for the higher grades to produce the stronger yarns. Bleached yarns of all the grades were weaker than the corresponding gray yarns; whereas the mercerized yarns were stronger, these finished yarns following closely the strength of the gray yarns. The irregularity of the sizings of the stock in process and of the strength and sizings of the yarns was independent of the grade of the cotton. Double bleached yarns were found more irregular than single bleached, whereas no marked difference was noted in the regularity of gray, single bleached, and dyed yarns. A formula is suggested for estimating the difference in the relative values of the grades.

The different grades of cotton were spun into 22's warp yarn satisfactorily. A considerable quantity of dust and fly was given off when running grades 7, 8, and 9. The finishing properties of the lower grades for bleaching and dyeing were not so satisfactory as those of the higher grades. The lower grades produced less bright yarns than did the higher grades, and brightness of the lower grades, obtainable by bleaching, was usually accompanied by a sacrifice of strength. The strength of the finished 22's warp yarns and the 28's two-ply soft twisted yarns followed in general the strength of the gray yarns. The effect of the finishing was practically the same for eastern and western yarns. The strength of the gray cloth followed closely the strength of the gray yarns. The strength and regularity of the finished yarns and cloth varied with the finishing plants and the methods used.

Handling rayon yarns in knitting, J. H. RIGBY (*Textile World, 71 (1927), No. 12, pp. 37, 39, figs. 3*).—Tests at the New Bedford Textile School gave indica-

tions that best results are had with rayon yarn when it is knitted under conditions of high relative humidity. Temperature and humidity should be closely controlled in the knitting room. Proper conditioning is claimed to make the yarn soft and pliable, to aid loop formation, and to help eliminate broken filaments and defective fabric.

The Textile Recorder year book, 1926 [and 1927], compiled and edited by F. NASMITH (*London: John Heywood; New York: Bragdon, Lord, Nagle Co., 1926, pp. CIII+960, figs. 195; 1927, pp. XCI+1004, figs. 211*).—Information regarding raw textile materials, spinning, weaving, and finishing methods, manufactured products, machinery and devices, commercial movement and practices, statistics, and economic conditions in the textile industries is compiled in these volumes.

The protective value of clothing fabrics, E. V. FLOYD and L. BAKER (*Textile World, 71 (1927), No. 10, pp. 65, 66, 85, figs. 3*).—Based on research by F. R. Clark at the Kansas State Agricultural College, this article reports results of tests on wool, cotton, and mixed fabrics designed to measure the protection afforded against escape of heat from the body. See also an earlier report (E. S. R., 56, p. 898).

[Furs], D. C. MILLS (*Jour. Home Econ., 18 (1926), Nos. 11, pp. 623–626; 12, pp. 691–695; 19 (1927), Nos. 1, pp. 16–19; 2, pp. 75–77; 3, pp. 136–141; 4, pp. 198–206*).—A series of nontechnical articles by the general director of the National Association of the Fur Indnstry on the followng topics relating to furs: The International Fur Trade; The Collection of Furs; The Preparation of Furs: Fur Dressing; The Preparation of Furs: Fur Dyeing; The Manufacture of Fur Garments; and Buying and Care of Furs.

MISCELLANEOUS

Forty-fifth Annual Report of [Ohio Station], 1926, C. G. WILLIAMS (*Ohio Sta. Bul. 402 (1927), pp. 156, figs. 29*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and a report of the director summarizing the work of the station during the year. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report [of Texas Station], 1926, A. B. CONNER (*Texas Sta. Rpt. 1926, pp. 96, fig. 1*).—This contains the organization list, a report of the acting director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1926, and for various State funds for the fiscal year ended August 31, 1926.

NOTES

California University and Station.—Plans are being drawn for a new animal science building at Davis, to cost $300,000. The building will house the division of animal husbandry, including dairy production, animal genetics, animal physiology, and animal nutrition; the division of entomology and parasitology; and the division of zoology. A sewage disposal system for the buildings at Davis, equipped with the latest type of Imhoff tanks and constructed at a cost of $50,000, has just been completed, and plans are being drawn for a new central heating plant to cost $50,000.

The agricultural engineering building, which has been under construction for the past year, has been completed at a cost of $140,000, including considerable built-in equipment. It is a concrete and steel structure and practically fireproof.

Leaves of absence have been granted to Dr. C. L. Roadhouse, head of the division of dairy industry, for European study, to H. A. Wadsworth, assistant professor of irrigation investigations and practice and assistant irrigation engineer, and to A. W. Christie, assistant professor of fruit products and associate chemist. After a sabbatical year at Cornell University, Frederick L. Griffin, associate professor of agricultural education, has been given the additional title of supervisor of non-degree instruction and transferred to Davis July 1. R. L. Adams, in charge of farm management work in the division of rural economics, has returned to the university after a year as State market director.

The biological control explorations, looking toward parasite introduction, have been revised, and E. W. Rust, collector for the Citrus Station, has been recalled from South Africa. Harold Compere is to be sent to Australia to investigate parasites of the citrus black scale, and C. F. Henderson transferred from South America to Mexico to obtain parasites for the sugar beet leafhopper.

Dr. J. B. Kendrick, assistant in botany in the Indiana Station, has been appointed associate plant pathologist, effective July 1, and will be located at Davis. Oscar Pearson has been appointed plant breeding assistant in the division of truck crops, effective July 1.

Michigan College and Station.—On May 13 the college celebrated its seventieth anniversary. In addition to other functions the new $600,000 Kedzie chemical laboratory and the new $350,000 armory and field house were dedicated.

For the next biennium the college has been allotted a total budget of $533,250 for additions to the plant, $3,000,000 for current operating funds, and $670,000 for agricultural extension. The contemplated additions to the plant include $75,000 for a new dairy barn, $50,000 for farm land purchases, $15,000 for drains, fences, etc., and $25,000 for a potato experimental substation, which will probably be located in the northern part of lower Michigan.

The new horse barn, 135 ft. long by 45 ft. wide and costing about $20,000, was occupied June 1.

The honorary degree of doctor of agriculture was conferred by the college at the recent commencement upon Deans F. B. Mumford of the Missouri University and Station and H. W. Mumford of the Illinois University and Station.

Andrew J. Patten, chemist of the station since 1907, has been granted leave of absence to engage in commercial work.

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EXPERIMENT STATION RECORD

VOL. 57 AUGUST ABSTRACT NUMBER No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Annual reports on the progress of chemistry for 1926, edited by C. SMITH (*Ann. Rpts. Prog. Chem.* [*Chem. Soc., London*], *23* (*1926*), *pp. X+11-344, figs. 6*).—This is the customary annual report (E. S. R., 55, p. 609).

Smith's inorganic chemistry, rev. by J. KENDALL (*New York: Century Co., 1926, rev. and rewritten, pp. XXV+1030, pls. 15, figs. 234*).—The book has been brought up to date[1] with many additions, but the reviser's purpose is stated to have been in the main "to leave the volume a characteristic Smith text."

Theoretical organic chemistry, Part I, F. ARNALL and F. W. HODGES (*London: J. & A. Churchill, 1926, pt. 1, pp. XI+372, figs. 27*).—In this college text of organic chemistry, the authors aim to "stress the underlying principles . . . rather than to produce a catalogue of organic compounds." The reactions of the aromatic series have been treated more fully than is usual on account of the general commercial importance of many of these derivatives. The text contains 115 illustrative experiments.

Organic chemistry, F. E. RICE (*New York and London: McGraw-Hill Book Co., 1927, pp. IX+303, figs. 28*).—This textbook is intended particularly for those in training as physicians, agriculturists, dietitians, and pharmacists, special emphasis being laid upon compounds, and properties of compounds, of special interest to this group.

The preparation and analysis of organic compounds, J. B. COLEMAN and F. ARNALL (*Philadelphia: P. Blakiston's Son & Co., 1926, pp. XVI+352, figs. 42*).—The book is divided into five sections, of which the first deals with the general manipulations of the organic laboratory, the purification of organic compounds, and the determination of the usual physical constants. In the second, a comprehensive series of preparations is arranged in families of related compounds, e. g., hydrocarbons, halogen compounds, alcohols, etc., rather than in the usual order of increasing difficulty, the purpose being to familiarize the student with general synthetic reactions. The specific and general theory is discussed with each preparation, and processes of general application have been selected as much as possible. Detailed directions minimize as much as possible the necessity for supervision. Section 3 deals with the qualitative identification of organic compounds and includes detailed tables of properties and tests;

[1] Introduction to Inorganic Chemistry, A. Smith. New York: Century Co., 1912, rev. ed., pp. XVIII+780.

section 4 covers ultimate analysis of organic compounds; and section 5 gives methods for the molecular weight determinations, estimation of groups, determination of ortho-, meta-, and para-isomers in mixture, etc. The book is a reference manual on organic preparation work, as well as a student's laboratory text.

On the pectin substances, II, III [trans. title], A. MEHLITZ (*Chem. Zelle u. Gewebe, 12 (1926), No. 5, pp. 348–361, figs. 2*).—Two papers are presented, continuing the previous part.[3]

II *The influence of the hydrolysis time on the determination of pectin according to the modified calcium pectate method.*—Experiments on the time necessary for the alkaline hydrolysis of pectin in the calcium pectate analytical method are reported. A solution of 0.45 per cent pectin content and having a pectin value of 41.1 per cent was used. Five-gm portions of this solution were placed in 400-cc. beakers with 100 cc. of N/10 alkali, and the hydrolysis carried for ½ hour, 1 hour, 2, 3, 4, 5, 7, 16, 24, 44, 92, and 164 hours. Hydrolysis was stopped by the addition of 50 cc. of N acetic acid in each case. After 5 minutes the pectin was precipitated with 50 cc. of 2N calcium chloride solution. The remainder of the analysis was carried out in the usual way. It was found that approximately 90 per cent hydrolysis was obtained the first half hour, 98.2 per cent after 5 hours, and complete hydrolysis after 7 hours. Extending the hydrolysis period to as much as 7 days did not alter the result of the pectin analysis.

III. *On the alteration of the pectins during the cooking process.*—Two series of experiments to determine this effect were made. The same pectin solution, with a pectin content of 0.81 per cent and a pectin value of 33.1, was used in both series.

In the first, 3 liters of the pectin solution were boiled in a 5-liter flask under a reflux condenser, the apparatus being provided with a siphon by means of which 50-cc. samples were withdrawn at the beginning of boiling and after ¼, ½, ¾, 1, 2, 3, 5, 8, and 10 hours, for analysis. The second series was similarly carried out with 2,500 gm. of the pectin solution to which 1,250 gm. of sugar was added, the sugar being brought into solution at 30° C. Samples from the experiments of this series were taken as before, from the beginning of boiling and at the same intervals up to 10 hours. The total acid as malic acid remained practically unchanged, as did the specific gravity and the pH value. The percentage of pectin and the pectin value figure, however, fell off, at first rapidly and then at a decreasing rate throughout the duration of the experiments. Curves representing the loss of pectin show that the pure pectin solution lost much more rapidly at first and somewhat more rapidly up to 5 hours than did the solution containing sugar. At about 5 hours of boiling, however, the curve for the loss of pectin in the pectin sugar solution crosses the curve of the pectin loss for the pure pectin solution, the final figure being 16.0 per cent average loss for the first series and 19.4 per cent average loss for the second, or pectin-sugar, series. Attention is called to the practical conclusion that the loss of pectin on cooking will be importantly less in the presence of sugar, provided the time of cooking does not exceed 2 hours.

The chemistry of lignin, W. FUCHS (*Die Chemie des Lignins. Berlin: Julius Springer, 1926, pp. XI+327*).—This monograph assembles the known facts concerning the occurrence, formation, and physical and chemical characteristics of lignin, its preparation in a pure state, the tests to which it responds, its substitution-, oxidation-, reduction-, and hydrolysis-products, its technology, and the

[3] Chem. Zelle u. Gewebe, 11 (1925), p. 134.

current theories with respect to its structure, relations, and origin. The book is not restricted wholly to the chemical viewpoint, but is intended to be of assistance also to investigators interested in lignin from the biological, botanical, or technological standpoints.

The enzymes, E. WALDSCHMIDT-LEITZ (*Die Enzyme. Brunswick: F. Vieweg & Son, 1926, pp. XVI+233, figs. 13*).—This monograph is in two parts, the first of which discusses the development of ideas with regard to enzymes, their general and physical chemistry, and other properties, with some general notes on their preparation. The second or special part takes up in some detail the individual enzymes grouped as esterases, proteases, amino-acylases, carbohydrases, catalases, peroxidases, oxidases, and fermentation enzymes.

Colours in foodstuffs, H. DRAKE-LAW (*Jour. Soc. Chem. Indus., 45 (1926), No. 49, pp. 428T–434T*).—The general characteristics of food colors are considered, special attention being given to fastness, to light, heat, acids, alkalies, sulfur dioxide, metals, etc., to the toxicity of certain classes of dyes and some individual compounds, and to the testing and analysis for metallic impurities in dyes commonly used for coloring foods. In the discussion following the presentation of the paper, the author calls attention to the enhanced toxicity of many metals when combined with organic colors rather than with the inorganic acid radicals.

Oils, fats, and waxes, H. M. LANGTON (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 11 (1926), pp. 312–340*).—The general condition of the (British) oil, fat, and wax industry is briefly noted, and commercial data on several important oils are reported. Brief notes on the year's work in the biochemistry of fats, the commercial preparation of glycerin, physicochemical studies on the fatty acids, soap making, hydrogenation, drying oils, waxes, and analytical methods are also included.

Paints, pigments, varnishes, and resins, J. A. F. WILKINSON ET AL. (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 11 (1926), pp. 341–392*).—A very brief statement of commercial data, with notes on the progress of the organization of a research association, is given, followed by summaries of the year's work on resins and solvents, including artificial resins; on drying oils, varnishes, and driers; cellulose ester varnishes and enamels; and pigments and paints, including notes on color measurement, exposure tests, etc.

The chemical composition of cottonseed oil from the Upland type of seed, G. S. JAMIESON and W. F. BAUGHMAN (*Oil and Fat Indus., 4 (1927), No. 4, pp. 131–135*).—A study of the components of the oil from the Upland type cotton seed is reported in which the glyceryl esters of the more important fatty acids were determined. These are presented in comparison with corresponding data for oil from the Sea Island type of cotton seed, the data being for the most part strikingly similar. The largest difference is in the percentage of oleic acid, the Upland oil yielding 30.5 per cent of oleic glyceride, while the Sea Island oil gave 35.2 per cent. Of linolic glyceride, the Upland oil yielded 44.8 and the Sea Island 41.7 per cent.

The chemistry of palm oil, W. BRASH (*Jour. Soc. Chem. Indus., 45 (1926), No. 49, pp. 438T–440T*).—From determinations of the free fatty acids and of some glycerides in the crude and in the neutral oil and from examination of a neutralized oil hardened to an iodine value of practically 0, it is concluded that appreciable quantities of acids other than palmitic and oleic are not present and that the presence of acids more unsaturated than oleic acid is doubtful in this oil. Tripalmitin, triolein, oleodipalmitin, and dioleopalmitin were found, the total amount of tripalmitin being approximately 10 per cent. Triolein was considered to be present to probably about the same extent, the

remainder consisting of mixed triglycerides. It is suggested that the principal odoriferous constituent of palm oil is an oxidation product of carotin.

Changes in olive oil after long standing, R. O. Brooks (*Oil and Fat Indus.*, *4 (1927), No. 4, pp. 139, 140, 150*).—An examination of olive oil samples exposed for some time to light in glass containers having some air space indicates that besides rancidity changes may develop which will give a misleading indication of adulteration of the original sample. It is suggested that the history of the older samples of olive oil should be carefully traced when the analytical data are such as to indicate prosecution.

The rapid iodine number methods and the per-iodine number of fats, B. M. Margosches (*Die Jodzahlschnellmethode und die Überjodzahl der Fette. Stuttgart: Ferdinand Enke, 1927, pp. X+227, figs. 31*).—This is the twenty-fifth volume of the author's "collection of monographs in the field of chemical, technicochemical, and physicochemical analyses." The present volume takes up the various methods for determining the iodine number of fats as ordinarily understood, and includes a treatment of aqueous iodine chloride and of various iodine solutions in relation to fats, a study of the methods for the determination of the per-iodine number (Überjodzahl) or over-iodine figure, and finally some study of the activation of iodine by water. The book contains not only a summary of previous work, but also a considerable amount of new experimental data contributed by the author himself.

A rapid method for the determination of starch, O. S. Rask (*Jour. Assoc. Off. Agr. Chem., 10 (1927), No. 1, pp. 108–120*).—The method described depends upon the observation that cold, rather concentrated hydrochloric acid disperses starch into a clear or slightly opalescent solution which can be filtered without loss of starch and from which the starch can be precipitated by the addition of approximately two volumes of alcohol. The experiments reported indicated (1) that a minimum concentration of about 20 gm. of hydrogen chloride per 100 ml. solution are required for the dispersion of starches at ordinary temperatures, (2) that solutions prepared in this way are filterable quantitatively without loss, and (3) that there is no detectable hydrolysis of the starch in the acid dispersed state within the time-temperature limits of 45 minutes at 25° C. The following method based upon these findings gave excellent results with various cereal products and no alcohol precipitate when applied to a starch-free wheat bran:

Transfer from 1 to 4 gm. of the finely ground material containing preferably from 0.5 to 1 gm. of starch into a 7- to 9-cm. filter and extract with washed ether, with 10 per cent alcohol, and with water, filling the filter 4 or 5 times with each; drain, transfer sample and filter paper to a 50-ml. beaker, and add 10 drops of cold hydrochloric acid containing 20.5 to 21.0 gm. HCl per 100 ml. solution. Crush the material with a flat-ended stirring rod to a paste free from lumps, add from 20 to 25 ml. of the acid, and stir to a smooth uniform suspension. Transfer to a 100-ml. flask recalibrated to allow for the volume of the filter paper, rinse the beaker with fresh portions of the acid, and add enough more to fill the flask to the mark. Mix thoroughly by shaking, filter through a dry asbestos mat in a Gooch crucible two-thirds filled with dry, fluffy asbestos, receiving the filtrate in a dry flask, and pipette 50 ml. of the filtrate into a 200-ml. beaker containing from 110 to 115 ml. of 96 per cent alcohol. This must be done within 35 minutes of the first contact of the acid with the starch.

Stir the resulting mixture continuously for 1 minute or until the precipitate has flocculated, allow the precipitate to settle, and decant the supernatant liquid through asbestos in a weighed Gooch crucible. Hold the precipitate in

the beaker as completely as possible to avoid slow filtration, wash the precipitate by decantation two or three times with 15 ml. portions of 70 per cent alcohol, and once with 96 per cent alcohol, decanting through the crucible. Crush the starch thoroughly with a flat-ended stirring rod during the washing, and transfer the precipitate to the Gooch with 96 per cent alcohol from a wash bottle. Finally, wash the precipitate once with from 20 to 25 ml. of anhydrous ethyl ether, dry to constant weight, cooling 20 to 30 minutes in a desiccator over P_2O_5 or freshly ignited CaO, and weigh as starch. The starch is very hygroscopic, so that the crucible must be covered during weighing.

A considerable number of notes which should be consulted before making use of this method are given.

The estimation of cuprous oxide produced in sugar analysis, C. S. Bisson and J. G. Sewell (*Jour. Assoc. Off. Agr. Chem., 10 (1927), No. 1, pp. 120-124*).—The following method is recommended as avoiding the difficulties mentioned by Caven and Hill[3] in their permanganate oxalic acid method for cuprous oxide:

"After heating and boiling the Fehling solution with the sugar solution, filter the mixture by means of suction through the filter prepared as described previously. Wash the cuprous oxide and beaker well with warm water (60° C.) to remove soluble substances. (It is not necessary to transfer all the cuprous oxide to the filter, as it may be washed by decantation in the beaker in which it was precipitated.) Remove the funnel from the suction flask, invert over the original beaker, shake out the pad and plate, and wash all cuprous oxide adhering to the funnel into the beaker with about 10 cc. of distilled water. Thoroughly disintegrate the pad by stirring with a glass rod. Add from a burette a quantity of the permanganate solution [3.16 gm. of potassium permanganate per liter of solution, standardized with sodium oxalate], in excess of that required to oxidize completely all the cuprous oxide; then add 10 cc. of 18 N sulfuric acid, sp. gr. 1.495, and stir the mixture until the precipitate is dissolved. (The quantity of permanganate solution added should be sufficient to impart a deep purple color to the solution.) While stirring the mixture, add from another burette 5 to 10 cc. of the ferrous sulfate solution [28 gm. of ferrous sulfate ($FeSO_4.7H_2O$) and 10 cc. of 96 per cent sulfuric acid, sp. gr. 1.84, per liter of solution] in excess of that required to destroy the pink color of the permanganate. (At this point in the procedure no particles of unchanged cuprous oxide should remain in the mixture nor should any manganese dioxide adhere to the asbestos.) Add distilled water to increase the volume of the solution to 250 cc., and titrate this solution with the permanganate solution to the appearance of the usual end point. (If the quantity of copper is sufficient to impart a blue color to the solution after adding the ferrous sulfate, the color change at the end point will be from blue to lavender. The end point can be detected easily and the color does not fade any more rapidly than in the determination of iron with potassium permanganate.) Calculate the weight of cuprous oxide in grams from the following equations:

$$(\text{Volume of } KMnO_4 - \text{Volume of } KMnO_4 \text{ equivalent to total volume of ferrous sulfate}) \times \frac{\text{Normal factor of } KMnO_4}{1000} \times \frac{143.1}{2} = \text{Weight of cuprous oxide.}$$

"If the weight of copper represented by the titration is desired, the atomic weight of copper (63.57) should be substituted for the constant $\frac{143.1}{2}$ in the above equation. If the standard solution of potassium permanganate is 0.1000 N, 1 cc. of it will be equivalent to 0.00715 gm. of cuprous oxide or to

[3] Jour. Soc. Chem. Indus., 16 (1897), pp. 981-983; 17 (1898), pp. 124, 125.

0.006357 gm. of copper. Reference to the Munson and Walker tables will give the weight of the sugar equivalent to either cuprous oxide or copper."

A study of methods proposed for the determination of the unsulfonated residue in petroleum spray oils, J. J. T. GRAHAM (*Jour. Assoc. Off. Agr. Chem., 10 (1927), No. 1, pp. 124–130*).—The following modification of the method of Gray and De Ong (E. S. R., 55, p. 759) is recommended:

"With a pipette, measure 5 cc. of the oil into a Babcock cream bottle. (After preliminary draining, in the case of heavy oils, to reduce the viscosity warm the pipette by drawing it several times through the flame of a Bunsen burner and then drain thoroughly.) In lieu of this procedure, determine the density of the oil and weigh the equivalent of 5 cc. Use a bottle about 15 cm. long—either the 9 gm. 50 per cent or the 18 gm. 30 per cent cream bottle. Add slowly 20 cc. of the 38 N fuming sulfuric acid, gently shaking or rotating the bottle, taking care that the temperature does not rise above 60° C., and cooling [with] ice water if necessary. When the mixture no longer develops heat on shaking, agitate thoroughly, place the bottle in a water bath, and heat at 60–65° for 10 minutes, keeping the contents of the bottle thoroughly mixed by shaking vigorously for a period of 20 seconds at 2-minute intervals. Remove from the bath and fill the bottle with concentrated sulfuric acid until the oil rises into the graduated neck. Centrifugalize for 5 minutes (or longer if necessary to obtain a constant volume of the oil) at 1,200–1,500 revolutions per minute. Read the volume of unsulfonated residue from the graduations on the neck of the bottle, and from this reading calculate the percentage by volume of the unsulfonated oil."

The changes involved in this procedure facilitate the reading of the volume of the oil column in the case of oils giving a black residue on sulfonation.

METEOROLOGY

Measurements of solar radiation and their interpretation, C. F. MARVIN (*U. S. Mo. Weather Rev., 55 (1927), No. 2, pp. 49–55, figs. 3*).—This article points out that while "Langley's pure bolographic process for evaluating the transmission losses of radiation in the earth's atmosphere still stands alone and supreme, provided the observations at any one station are reckoned in a manner that makes them completely independent of those at any other station . . . , pyrheliometer readings alone at high-grade stations serve nearly all purposes, especially if supplemented by simple meteorological observations, all of which are very easily made."

The author proposes that "arrangements be made for the prompt publication of some such original observations from each station, as follows: (1) Pyrheliometer observations whenever possible at three or more different air masses; (2) psychrometer readings or equivalent measures of local humidity, including air pressure and state of sky with respect to haze, clouds, etc.; (3) some evaluation from one or more bolograms of the area, or other quantitative measure in comparable units, of the major water vapor absorption bands in the solar spectrum."

Papers on the reality of meteorological periodicities (*U. S. Mo. Weather Rev., 55 (1927), No. 2, pp. 66–71, figs. 6*).—This includes an introductory note by C. F. Marvin and discussions of The Improbability of Rainfall Cycles, by C. E. Grunsky, and Sunspots and Rainfall, by A. Streiff.

Opposing views concerning periodicities in rainfall and stream flow are expressed. Grunsky concludes that "longer time is needed to prove the existence of any notable cycle, or, perhaps, to establish conclusively, as the writer be-

lieves, that none will ever be found." Streiff questions the validity of denial of a relation between sun spots and rainfall on the basis of data now available.

Investigation of rainfall periodicities between 1⅛ and 2½ years by use of Schuster's periodogram, D. ALTER (*U. S. Mo. Weather Rev., 55 (1927), No. 2, pp. 60–65, figs. 6*).—This paper "continues previous applications of Schuster's periodogram to the rainfall of the world, in this case for shorter periods than considered in them. The evidence continues favorable, and is even stronger than before, in favor both of the existence of what may be termed a 'spectrum' of related periods and of their relation to the sun-spot period. It also begins to differentiate strongly between fairly constant periods and variable cycles, in favor of the former."

Monthly Weather Review, [January–February, 1927] (*U. S. Mo. Weather Rev., 55 (1927), Nos. 1, pp. 48, pls. 11, figs. 10; 2, pp. 49–106, pls. 12, figs. 20*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for January and February, 1927, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 1.—Convection in the Free Atmosphere and Over a Heated Surface (illus.), and The Theory of Atmospheric Turbulence—An Historical Résumé and an Outlook, both by C. G. Rossby; Critical Spring Temperatures for Apples in the Yakima Valley, Wash. (illus.), by E. S. Ellison and W. L. Close (see p. 208); F. M. Exner on Dynamical Meteorology, by E. W. Woolard; and The "January Thaw" (illus.), by R. Nunn.

No. 2.—Measurements of Solar Radiation and Their Interpretation (illus.), by C. F. Marvin (see p. 206); Meteorological Factors in the Quartz Creek Forest Fire (illus), by H. T. Gisborne; Investigation of Rainfall Periodicities between 1⅛ and 2½ Years by Use of Schuster's Periodogram (illus.), by D. Alter (see p. above); Papers on the Reality of Meteorological Periodicities (see p. 206); Lag of Thermometers and Thermographs for Aircraft (illus.), by H. B. Henrickson and W. G. Brombacher; A Layman's Notes on the Hurricane Tide at Miami, by W. J. Schubert; and Meteorological Observations at Negritos, Peru, December, 1924, to May, 1925 (illus.), by E. W. Berry.

Climatological data for the United States by sections, [1926] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 13 (1926), No. 13, pp. [230], pls. 14, figs. 18*).—This number summarizes the climatological data for each month of 1926 and for the year as a whole for each State.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and W. H. PARKIN (*Massachusetts Sta. Met. Buls. 459–460 (1927), pp. 4 each*).—The usual summaries and notes are given of observations at Amherst, Mass., during March and April, 1927.

Weather of the season, P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1926, pp. 4–7*).—The usual summaries of observations on temperature and precipitation at the West Central Experiment Station, Morris, Minn., during 1926 as compared with previous years are given, with notes on the general features of the weather of the season.

"The weather during the growing season of 1926 was characterized by approximately normal temperatures with a deficiency of rainfall during the spring and early summer months. The total rainfall for the year amounted to 21.63 in., while the 18-year average rainfall recorded at the Morris station is 24.69 in. Only 0.75 in. of rain was recorded in March and 0.12 in. in April."

The climate of Long Island: Its relation to forests, crops, and man, N. TAYLOR (*New York Cornell Sta. Bul. 458 (1927), pp. 20, figs. 2*).—The avail-

able observations at five stations on Long Island and in New York City on temperature, including frosts; precipitation; wind; and evaporation are summarized and discussed.

The outstanding fact brought out with reference to temperature is that the eastern end of the island is decidedly cooler than the western end and the onset of spring as shown by the blooming of certain shrubs, and the leafing of trees is 10 or 12 days earlier in Brooklyn than at the eastern end of the island. The significant differences in temperature, however, are revealed more clearly in the extremes than in the means. The average annual rainfall is 44.95 in. for the island as a whole, 46.95 in. near the center of the island, and 41.79 in. at the eastern extremity. The lower rainfall at the eastern extremity is ascribed mainly to excessive wind and high evaporation. The lowest rainfall during the growing season, April to November, is found in the central part of the island. The distribution during the different months, however, is uneven at the different places. With the exception of certain extraordinarily exposed windy places, the evaporating power of the air is without regional significance, although in places of high evaporation conditions extremely critical for plant growth occur.

Critical spring temperatures for apples in the Yakima Valley, Wash., E. S. ELLISON and W. L. CLOSE (*U. S. Mo. Weather Rev., 55 (1927), No. 1, pp. 11–18, figs. 8*).—A study extending over four spring seasons indicated that the temperature of the dew point at the time of the frost, which can be correlated with the temperature of the dew point at 4.40 p. m. on the afternoon preceding the frost, is a very important factor in any accurate scale of critical temperatures for apples.

"Evidence in this paper shows unmistakably that the dew point at the time of the frost has a very important bearing on the amount of damage that will be caused by low temperature. When the dew point is 32° [F.] when the air temperature reaches 32°, and the dew point falls as the temperature falls, severely low minimum temperatures can be endured with but slight damage, whereas the same temperature conditions with a low dew point will cause very severe damage."

Conditions which determine the point at which damage begins with apples in different stages of development are defined, and a new scale of classifying stages of development is given. It was observed that "different varieties of apples show different degrees of resistance to frost. Furthermore, each variety seems to have a particular stage or stages of development wherein it is particularly susceptible to injury. Thus, for instance, Delicious and Winesap show relatively the same measure of resistance to a given condition in the earlier stages of development, but in later stages Delicious proves to be more tender than Winesap."

SOILS—FERTILIZERS

Soil survey of Winneshiek County, Iowa, T. H. BENTON and N. J. RUSSELL (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1457–1492, pls. 3, fig. 1, map 1*).—The area surveyed comprises 439,040 acres in the northeastern part of Iowa. The county consists of a broad, smooth, but not entirely level plain dissected by a widely ramifying drainage system. The maximum relief of the county is 600 ft.

The soils of this area have been mapped and classified, in cooperation with the Iowa Experiment Station, in 21 series of 31 types, Tama silt loam 30.9 per cent, Fayette silt loam 25.6 per cent, and Carrington loam 12.1 per cent occuping the largest areas. Rough stony land, and muck, unclassified, cover

Soils of the Purchase Region of Kentucky, S. D. Averitt and S. C. Jones (*Kentucky Sta. Bul. 277 (1927), pp. 40, fig. 1*).—This report describes the soils of a region whose main types are mapped and listed in Bulletin 194 of the station (E. S. R., 34, p. 122), the U. S. D. A. Bureau of Soils survey of McCracken County (E. S. R., 19, p. 417), and the Kentucky Geological Survey of 1888.[4]

The present bulletin adds a chemical study of the plant food constituents of the following main soil groups: Deep loess, the medium loess soils of the western part, the medium loess soils of the eastern part, the large-river first bottom soils, large-river second bottom soils or terrace soils, and creek and small stream bottoms. The total nitrogen, total phosphorus, total potassium, phosphorus soluble in 0.1 N nitric acid, soluble potassium, soluble calcium, and the acidity, calculated as equivalent calcium oxide per acre of 2,000,000 lbs. of surface soil, and per acre of 4,000,000 lbs. of subsoil, are given.

Data previously noted as to results from soil experiment fields in the region (E. S. R., 56, p. 812), together with suggestions for the use of limestone and phosphates and the fertilization of tobacco are appended.

Soil survey of Ray County, Missouri, A. T. Sweet and H. V. Jordan (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1423–1456, pls. 4, figs. 2, map 1*).—Ray County includes an area of 361,600 acres in the western part of Missouri, and consists of two principal topographical divisions, a rolling to rough and broken upland occupying the greater part of the county, and a belt of flood plain extending across the southern part and, in narrow strips, along the larger streams into the interior. About one-half of the upland is drained by the Crooked River and its tributaries. The drainage is for the most part good, but small areas in both uplands and stream bottoms require artificial drainage.

In cooperation with the Missouri Experiment Station, the soils of this area were mapped and described in 16 series of 24 types, in addition to 0.7 per cent of riverwash, unclassified. The largest portions of the area are occupied by the Wabash and Pettis silt loams, which cover 14.7 and 14.5 per cent of the total area, respectively.

The soils of the glacial lake region of northeastern Ohio, G. W. Conrey (*Ohio Sta. Bimo. Bul., 12 (1927), No. 2, pp. 48–59, figs. 10*).—The beach ridges formed in the successive stages of the recession of the glacial lake, 150 to 200 yds. wide and 20 to 40 ft. above the lake plain, constitute the most striking topographic feature. The ridges are well drained on account of local relief and their gravelly composition. The lake plain is mostly level with occasional low knolls and irregular, usually sandy ridges.

The soils of this region are described in 21 series of the following 5 groups: (1) Lacustrine soils, (2) deep glacial soils, (3) shallow glacial soils over sandstone or shale, (4) terrace soils, and (5) flood plain soils. The more important types in these series are mentioned.

Soil survey of Cameron County, Texas, M. W. Beck and B. H. Hendrickson (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+537–575, pls. 5, fig. 1, map 1*).—In cooperation with the Texas Experiment Station, the soils of an area of 561,280 acres in the extreme southern part of Texas were classified and mapped as 8 series of 14 types, together with 1.9 per cent of dunesand, unclassified. Lomalto clay 22 per cent, Victoria clay loam 19.9 per cent, Harlingen clay 17.9 per cent, and Laredo silty clay loam 11.8 per cent were the more important soils noted.

The topography of the county is that of a flat plain, sloping gently northeastward. Drainage is comparatively poor, many large areas having no natural drainage outlets.

[4] Report on the Geological and Economic Features of the Jackson's Purchase Region, R. H. Loughridge. Ky. Geol. Survey, Vol. F, 1888, pp. 357.

Permeability of soils (*New Mexico Sta. Rpt. 1926, pp. 13–15*).—In continuation of the study of alkali soils at this station (E. S. R., 55, p. 417), experiments are reported on the crushing or breaking strength of these soils. A soil of low natural permeability and a soil of fair permeability were studied. Tests were made without the addition of any compound, and before and after leaching with initial contents of sodium chloride, sodium carbonate, and aluminum sulfate of 0.5 per cent. Briquettes were made by adding water, pressing into a mold, and drying in the sun, as in making adobe brick. Cylindrical briquettes were also made by machine at 2,000 lbs. pressure, sufficient water being added to produce maximum density. The briquettes were tested to breaking in an Olsen testing machine. The low permeability soil had a breaking strength of about 42 lbs. per gram in the brick-shaped and 100 lbs. per gram in the cylindrical briquettes. The soil of fair permeability showed a breaking strength of about 49 lbs. in the brick-shaped and 95 lbs. in the cylindrical briquettes. The presence of sodium chloride and aluminum sulfate lowered the breaking strength. Leaching increased the breaking strength for the cylindrical briquettes to about 106 lbs. per gram for both the sodium chloride and the aluminum treated soils. In general, the presence of soluble compounds tended to weaken briquettes such as adobe brick made from fine-textured soils.

Permeability and flocculation were improved by the addition of aluminum sulfate or of iron sulfate, the experiments indicating that the permeability of fine-textured soils is dependent on the degree of dispersion of colloids. In experiments on the effect of the head of water on the penetration of water in an air-dried soil of low permeability, 1-ft. columns of the soil in glass tubes were irrigated simultaneously under constant heads of 5, 10, and 20 in. of water. Increasing the head of water appeared to decrease the rate of penetration. This is attributed to the plasticity, when wet, of soils of low permeability and to the compression of the plastic constituents at lower depths, with the resulting diminution of the pore space.

Aluminum hydroxide in alkaline soils and its effect upon permeability, W. T. McGeorge, J. F. Breazeale, and P. S. Burgess (*Arizona Sta. Tech. Bul. 12 (1926), pp. 257–305, figs. 11*).—In a study of aluminum compounds in black alkali soils, a preliminary paper upon which has been noted (E. S. R., 56, p. 619), it was found that, on lowering the pH of such soils either by leaching or chemical treatment, the soluble aluminates are precipitated as aluminum hydroxide, the pH region of least solubility of aluminum hydroxide as determined by the electrometic titration of pure aluminum salts with sodium hydroxide, calcium hydroxide, sodium hydroxide in the presence of calcium carbonate and with sodium bicarbonate, having been found to be about pH 8.1. Soluble aluminum, however, was found at all pH values except in the titration with sodium bicarbonate and with sodium hydroxide in the presence of calcium carbonate. The sodium bicarbonate gave negative aluminum tests above pH 5.4, and sodium hydroxide in the presence of calcium carbonate gave negative tests from pH 7.2 to 7.8, inclusive. Aluminates were found to act as mobile carriers of aluminum within black alkali soils. The coagulation of soil colloids by alum is regarded as largely a function of H-ion concentration, no coagulation taking place until the hydrolyzable alkalinity of the sodium zeolites has been largely neutralized and the reaction brought to pH 8.6 or lower.

Summer leaching of black alkali soils is recommended as a reclamation measure, the warmer water precipitating aluminum hydroxide in a less dispersed condition. Intermittent leaching with drying out is also advised, aluminum hydroxide being a largely nonreversible colloid which loses on drying

its jelly-like properties, to which properties the "freezing up" of black alkali soils during leaching is largely due.

A study of the toxicity of salines that occur in black alkali soils, J. F. Breazeale (*Arizona Sta. Tech. Bul. 14 (1927), pp. 337–357, figs. 5*).—In solution culture and pot culture experiments with black alkali soils and with such toxic salines as they are known to contain, the conclusion was reached that all alkali salts must be in the form of solution in the soil to have a toxic effect upon the plant, and that the presence of finely divided, insoluble substances, such as sand, clay, or silt, or of colloidal substances, does not affect the toxicity of alkali salts actually in solution in the soil. It is considered that the limit of endurance of a plant for alkali salts should be expressed upon the basis of the composition of the soil solution at the wilting point of the plant rather than upon the percentage of the salt on the basis of the dry soil.

Of the individual salts studied, sodium carbonate was found to be more than twice as toxic as sodium bicarbonate and sodium hydroxide more than twice as toxic as sodium carbonate, but both sodium hydroxide and sodium carbonate acted as stimulants to plants in all concentrations ordinarily found in the soil solution of black alkali soils, and sodium bicarbonate is considered seldom to occur in toxic concentrations. The infertility of black alkali soils is atributed to often toxic amounts of sodium chloride and sodium sulfate and to their extremely unfavorable physical condition, such that they neither take water readily nor drain rapidly, rather than to the amounts of sodium hydroxide, carbonate, or bicarbonate usually found in them.

Sodium hydroxide rather than sodium carbonate the source of alkalinity in black alkali soils, J. F. Breazeale and W. T. McGeorge (*Arizona Sta. Tech. Bul. 13 (1926), pp. 307–335, figs. 12*).—In experiments on the extraction of salts from black alkali soils the concentration of hydroxyl and bicarbonate ions was found to decrease with the ratio water : soil, until in the true soil solution little or no hydroxyl ion, no sodium carbonate, and usually very little sodium bicarbonate in solution were present. This is attributed largely to a suppression by common ion effect of the hydrolysis of the sodium zeolite, from which, by base exchange with calcium carbonate, the sodium carbonate and hydroxide causing the alkalinity of black alkali soils are considered to be derived. At least 20 parts of water to 1 part of soil were found necessary for an approximately complete extraction of the sodium salts. The common ion effect was found to interfere with the gypsum neutralization of the black alkali soils unless the soluble sodium salts were leached out, permitting the hydrolysis necessary to a base exchange with calcium sulfate of the sodium zeolite.

Effect of mulches on soil temperatures during the warmest week in July, 1925, A. Smith (*Hilgardia [California Sta.], 2 (1927), No. 10, pp. 385–397, figs. 12*).—In paper mulch experiments at Davis, similar to those of Shaw at Berkeley in 1924 (E. S. R., 55, p. 316), temperatures at a depth of 0.5 in. averaged 10° F. warmer during the day and 5.6° cooler at night in the bare plat than in a plat covered with perforated black mulch paper. At a depth of 6 in., the average day temperature was 0.9° higher, and the average night temperature 0.8° higher in the bare plat. Decided differences between the day and night temperatures of the bare plats were found to a depth of 12 in. The temperatures at a depth of 3 in. in 5 plats under various mulches were highest in the plat covered with solid black paper. With the perforated black paper temperatures at this depth were about the same as in the bare plat. The lowest temperatures noted were in the plats covered with gray paper. At a depth of 12 in. the plat covered with the solid black paper was the warmest. Maximum temperatures at the 12 in. depth were found usually about 8 hours after the

maximum air temperature and showed a range in various plats of 11.6°, whil the minimum temperatures at the same depth occurred at an average interva of 6 hours after the minimum air temperature and had a range of 10.6° Under the conditions of these experiments, standard perforated mulch paper showed no material effect in increasing the soil temperatures.

Maximum height of capillary rise starting with soil at capillary satura tion, C. F. SHAW and A. SMITH (*Hilgardia [California Sta.], 2 (1927), No. 11 pp. 399–409, figs. 2*).—In experiments conducted at Berkeley and Davis, the rise of water to the surface through Yolo sandy loam and Yolo loam when wetted by rains or irrigation was found to be fairly rapid when the water table stood a 4 ft. below the surface, was slower with the water table at 6 ft. below the sur face, and was comparatively slight with the water table at 8 ft. The 8-ft. depth appears to be close to the limit for such capillary rise, practically no water being lost from the soil when the water table was at 10 ft. below the surface. The experiments are regarded as suggesting that, for sandy loams and loams in general, water tables at 10 ft. or more below the surface would be below the maximum height of capillary rise and would result in no movement of water to the surface.

Legumes plowed down for corn, J. S. CUTLER and H. R. HOYT (*Ohio Sta. Bimo. Bul., 12 (1927), No. 2, pp. 39, 40*).—In rotation experiments at the Paulding County Farm, biennial white sweet clover seeded with oats and plowed down for corn the next spring increased the corn yield by 18 bu. and the oats yield by 9 bu. These gains have more than doubled those obtained from either medium red or mammoth clover. The soil, which was a dark gray, heavy-phase clay, requiring tile drainage, became more friable and dried out faster in the spring as a result of the green manuring treatment. In a corn, oats, and legume hay rotation also, white sweet clover was found superior to medium red or mammoth clover in its effect on the corn and oats yield.

[Soil studies at the California Station] (*California Sta. Rpt. 1926, pp. 49, 75, 76*).—In a continuation of the alkali soil investigations by Kelley and Thomas (E. S. R., 55, p. 318), the application of sulfur, at Fresno, continued to give satisfactory results. The soil is becoming normal and good yields of alfalfa have been obtained. Iron sulfate and gypsum have also proved satisfactory correctives. The Kearney Vineyard experiments are yielding similar indications.

In soil biological investigations, the experiments indicate that a short incubation (one week) of the soil without the addition of fertilizer is useful in estimating the natural ability of a soil to replenish the soil solution.

[Soil and fertilizer studies at the Georgia Station] (*Georgia Sta. Rpt. 1926, pp. 128–131, figs. 3*).—In composting experiments with rock phosphate, stable manure, and sulfur, the phosphorus of the floats was not made more available during composting, but the sulfur proved an excellent preservative for the nitrogen in the manures, the least loss in dry matter being observed in the compost containing sulfur and rock phosphate. Sorghum readily utilized the nitrogen in composts supplied to a sandy soil.

The progress of potash studies with cotton plants grown under controlled and comparative conditions, and of experiments on the relative availability of the phosphorus of dicalcium and tricalcium phosphate, of tricalcium phosphate with calcium carbonate, of aluminum phosphate, of iron phosphate with calcium carbonate, and of monocalcium phosphate is reported. When large amounts of the iron phosphate were present in the pots the cotton plants were killed. Cotton plants did not grow with the usual water-soluble nutrients and ferric sulfate unless large amounts of tricalcium phosphate were present.

A comparison of Florida soft rock phosphate, Tennessee brown rock phosphate, and Tennessee blue rock phosphate showed the first two to give about the same growth, whereas the Tennessee blue phosphate was inferior to both the others.

[**Soil and fertilizer studies at the Morris Substation**], P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1926, pp. 8–13, 15–19*).—The series of fertilizer experiments previously noted (E. S. R., 56, p. 513) was continued in 1926. A study of 10 years' average yields showed rock phosphate to have been quite as effective as acid phosphate in increasing the clover yields, but this is the only crop that has shown any marked response to raw rock phosphate.

In experiments on the rate of manuring, in 1926 corn gave average yields of 40.5 bu. per acre on the untreated plats, increasing 7 bu. per acre on plats receiving 4 tons per acre of manure. The 8- and 16-ton applications yielded successively greater crops, but the 32-ton application produced a yield slightly less than that from the 16-ton treatment. The results of these experiments are assembled in four tables.

In experiments with wheat straw and corn stover as fertilizers over a period of 11 years, the yields of both corn and wheat have been increased by the use of both these crop residues. In the clover-utilization rotation, the results thus far "clearly indicate that it is not profitable to plow under clover on the average silt loam soil in western Minnesota."

[**Soil fertility investigations at the North Carolina Station**] C. B. WILLIAMS (*North Carolina Sta. Rpt. 1926, pp. 13, 14, 15–19, 20, 21, figs. 3*).—A study of the relation of acidity to nitrification in muck soils showed that nitrification was active in soils as acid as pH 4.3, the concentration of nitrate nitrogen reaching 153 parts per million in a 32-day incubation. Sixty-four parts per million of nitrate nitrogen applied as nitrate of soda gave an increase of 40 parts per million after incubation. The denitrification indicated is not regarded as sufficient to deprive a growing crop of available nitrogen.

Acid phosphate decreased the yield of corn on these soils, but pure dicalcium phosphate was not found to affect soil acidity or nitrification or carbon dioxide evolution. Soluble iron was not found to be increased, although injury in the field is associated with deposition of iron in the nodal tissue. Adding stable manure greatly accelerated carbon dioxide evolution without appearing to affect other soil properties. There was no change in the reaction of the soils receiving manure. In a comparison of ground marble, precipitated chalk, and ground dolomite, the latter showed the greatest acceleration of oxidation of the soil carbon during the first two weeks of incubation, but later results showed very little difference between these sources of lime.

At the Upper Coastal Plain Substation, 16–8–8 and 18–6–6 fertilizers used at the rate of 400 lbs. per acre gave yields very little different from those obtained with 8–4–4 and 9–3–3 fertilizers used at the rate of 800 lbs. per acre.

A comparison of hydrated lime, ground limestone, and marl in applications varying from 1 to 4 tons per acre showed that the ground limestone was the most efficient liming material on the muck soil at the Blackland Substation.

At the Piedmont Substation, phosphoric acid and nitrogen were found to be the main limiting plant food factors for corn, cotton, and wheat on Cecil clay loam. Some potash, however, was necessary for all the crops. In rotation experiments, six crops of corn from a 3-year rotation averaged 13.7 bu. per acre more than corn grown continuously. Wheat in this rotation averaged 12.7 bu. as against 9.4 bu. without the cover crop. Acid phosphate was found to be a more efficient source of phosphoric acid than soft phosphate rock when applied in normal amounts with nitrogen and potash for cotton, corn, and wheat.

With double the amount of phosphoric acid from the two sources, combined with nitrogen and potash, the acid phosphate was more effective for cotton and wheat, but not for corn.

At the Mountain Substation, on Toxaway loam, seven years' results show that mixtures containing acid phosphate give larger yields of corn, wheat, and red clover in rotation than finely ground phosphate rock mixtures. This was true both with and without lime applications. On plats receiving no lime, a basic slag mixture yielded 43 per cent more red clover hay than the acid phosphate mixture, but when lime was applied the acid phosphate produced 10 per cent more yield than the basic slag. Acid phosphate for corn gave 33 per cent greater yield on limed plats than did the basic slag, but on unlimed plats the basic slag gave the better yield by 11 per cent. Wheat yields were greater from basic slag than from acid phosphate whether with or without lime, though the difference in yields was greater from the plats receiving no lime. Some other fertilizer experiments of the usual type are reported.

A recent tabulation of the soil types of the State, 73 of the 100 counties of which have been surveyed and mapped, is given.

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The relative value of different carriers of phosphorus, A. G. McCall (*Maryland Sta. Bul. 289* (*1926*), *pp. 154–177, figs. 5*).—From a series of experiments on various sources of phosphoric acid, it is concluded that under certain conditions raw rock phosphate can compete with acid phosphate as a carrier of phosphorus, but that under most conditions, either when used alone or in combination with stable manure, the acid phosphate is the more economical source of phosphorus. Acid soil conditions, however, seem to favor the raw rock phosphate.

The increases in crop value were greater for the acid phosphate on the heavy silt loam of the Branchville field, on the fairly productive Sassafras loam of the Ridgely field, and on the gravelly loam of the Frostburg field, but at the Leonardtown field the raw rock phosphate, or floats, gave larger increases than the acid phosphate used alone or as a reinforcement for manure. On the Chester loam soil of the Sparks field the acid phosphate gave increases almost 50 per cent greater than did floats, as a reinforcement for manure. On the same type of soil at the Doughoregan field, 500 lbs. per acre of acid phosphate gave slightly larger returns than 1,000 lbs. of floats, but when these carriers were used as a reinforcement for manure the returns from the floats were distinctly larger than from the acid phosphate.

Analyses of commercial fertilizers and ground bone; analyses of agricultural lime, 1926, C. S. Cathcart (*New Jersey Stas. Bul. 444* (*1926*), *pp. 40*).—Supplementing Bulletin 440 (E. S. R., 56, p. 514), this bulletin lists the commercial fertilizers, ground-bone preparations, fertilizer materials, and agricultural liming materials registered for sale in New Jersey for the year ended October 31, 1926, with the usual analyses and guaranties, and includes also some data on the relative popularity of various formulas and on the average cost per pound of plant food in the brands sold.

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AGRICULTURAL BOTANY

Organic synthesis in the plant world [trans. title], M. POLONOVSKI (*Bul. Soc. Chim. Biol., 7 (1925), No. 5, pp. 526–589*).—This review seeks to bring into relief the incompleteness of the present state of knowledge regarding the synthetic mechanism of plants.

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The selective absorption of potassium by plants [trans. title], G. ANDRÉ and E. DEMOUSSY (*Bul. Soc. Chim. Biol., 7 (1925), No. 7, pp. 806–810*).—Tabulation is given of the potassium, the sodium, and the potassium-sodium ratio in three zones of beet root as examined on July 31 and October 31, 1924.

Some observations on the distribution of calcium oxalate crystals in plant tissues, and their probable rôle in plant metabolism, GIRIJA PRASANNA MAJUMDAR (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 187*).—Calcium excess is supposed to be utilized in precipitating oxalic acid and soluble oxalates. In oxalate-free plants oxalic acid or oxalate either is not produced or is produced in a quantity insufficient to cause harm to the plant system. It is inferred from the disappearance of oxalate crystals from the lower vegetative regions of certain plants, from water culture experiments, and from the study of the proportion of oxalate crystals formed and calcium salt present in certain plants, that calcium oxalate is reintroduced into the metabolic cycle and that a limited supply of calcium may be sufficient for the life of the plants.

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63 (1926), No. 4, pp. 483–500, fig. 1).—Plants vary pH values relatively rapidly in a weak potassium chloride solution. Apparently no physiological influence of potassium chloride is here involved. Acid materials are given up by peas, horse beans, lupines, and wheat; basic by oats, barley, rye, and mustard. Heat and soil and manurial effects are noted. Supposedly a certain rôle in nutrient uptake may be played by a difference in potential which has been shown to exist between soil and plant.

The energy of growth.—IV, The energy yield of various carbohydrates during growth of the higher plants [trans. title], E. F. Terroine, S. Trautmann, R. Bonnet, and R. Jacquot (*Bul. Soc. Chim. Biol., 7 (1925), No. 5, pp. 461–473*).—Plantlets of Arachis separated from the cotyledons and developed on a medium containing as aliment only certain sugars developed very well. Apparently there is no necessary connection between the plantlet and the nature of the seed reserve, the carbon being drawn indifferently from fats or carbohydrates. Particulars and confirmations are indicated.

Some causes of "starchiness" in corn, G. H. Dungan (*Illinois Sta. [Bul. 284, abs., 1927], pp. 4, fig. 1*).—This is a condensation of Bulletin 284, previously noted (E. S. R., 56, p. 546).

Pollen tetrad wall formation in Lathraea, R. R. Gates (*Cellule, 35 (1925), pp. 47–59, pl. 1*).—In this paper the process of wall formation in the pollen tetrad in *L. clandestina* is described.

The chemical composition of plants in relation to photoperiodic changes, G. T. Nightingale (*Wisconsin Sta. Research Bul. 74 (1927), pp. 68, figs. 20*).—Having noted the influence of the carbohydrate content on the type of growth in plants as studied since the work of Kraus and Kraybill (E. S. R., 40, p. 40), and the importance of photoperiodicity in connection with growth responses of plants, as shown by Garner et al. (E. S. R., 51, p. 125), the author investigated some growth responses which took place in plants when given various light and nutrient treatments. It was found that nitrates may be stored by the plant within itself until conditions arise for synthesis to other nitrogenous substances. Type of growth is not necessarily affected by the presence or absence of nitrates. Proteolysis to nitrates did not occur in tomato plants even after 284 hours of continuous darkness. Apparently, hemicellulose is utilized as a sugar source, though probably little degradation of hemicellulose occurs without marked depletion of starches and dextrins. Four classes, based upon those of Kraus and Kraybill, are suggested.

Throughout this work, relative and not total amount of plant foods was associated with type of growth response. Total plant food was correlated only with total growth. When reserve carbohydrates are depleted and there is no external supply of nitrogen or opportunity for carbohydrate synthesis, increase in amino acids and in amide and proteose nitrogen is associated with decomposition of protein. This condition may go far enough to result in a weakly vegetative growth, or in death, with an enormous increase of soluble nitrogen, a fraction which may be comparable to a "ureide fraction" secured by Chibnall (E. S. R., 52, p. 325). If, under these conditions, carbohydrates early become available, there eventually occurs a decrease in this supposed ureide fraction, as also of amino, amide, and proteose, with an increase in protein nitrogen and an associated increase in carbohydrates. Particulars are given of the behavior in tomato plants, salvia, buckwheat, soy bean, and radish.

Carbohydrates accumulated in the short-day plants, supposedly because of their relatively slight utilization in the synthesis of nitrates to other forms of nitrogen.

Data are given indicating that the growth responses and the associated relationship of carbohydrates to nitrogen in roots are unlike the growth

response and associated relationship of carbohydrates to nitrogen in the tops of the same plants. In general, the leaves and stems of the same plant are in this respect similar. In all cases the root system of weakly vegetative high carbohydrate plants was proportionally much more extensive than the root system of plants low in carbohydrates and vigorously vegetative. Plants subjected to a short photoperiod gained more in absolute amount of nitrogen than did plants which were subjected to a long photoperiod.

Influence of temperature on permeability of protoplasm in Beta vulgaris, D. de V. Smits (*Invloed der Temperatuur op de Permeabiliteit van het Protoplasma bij Beta vulgaris L. Proefschr., Rijks-Univ., Utrecht, 1925, pp. 100+8, figs. 12*).—This is a University of Utrecht thesis.

Physiological features of roots, with especial reference to the relation of roots to aeration of the soil, W. A. Cannon (*Carnegie Inst. Wash. Pub. 368 (1925), pp. III+168, figs. 21*).—Following an introductory portion on soil-plant-oxygen relations, an account of apparatus and methods, and a chapter by E. E. Free on Differences Between Nitrogen and Helium as Inert Gases in Anaerobic Experiments on Plants, this publication deals in systematic form with root growth in relation to a deficiency of oxygen or an excess of carbon dioxide and presents some particulars and a few general conclusions regarding the aeration relations of roots.

"The reaction of roots to a deficiency of oxygen was observed in about 30 species, varying greatly in habit and often from unlike habitats. When oxygen was entirely removed from the soil in which the roots were growing, growth ceased in all species. Many of the species, possibly most of them, were found to maintain a certain although slow growth rate in as little as 0.5 per cent oxygen for a limited period of time. Preliminary experiments suggest the possibility that in event of a very low partial pressure of oxygen in the soil there may be a slow downward movement of oxygen into the root from the shoot, and finally into the soil from the root itself. . . .

"For all species studied there was found to be a concentration of oxygen in which growth would not continue, whatever the temperature may have been. For convenience, the lowest concentration of oxygen at which growth will just take place for any temperature is called the lower critical concentration for the species and for the temperature. The lower critical oxygen concentration, in all of the species examined, was greatest at the highest temperatures and least at the lowest temperatures. The extreme differences in the lower critical concentration of oxygen for growth as between the species studied did not appear to be over 1 or 2 per cent, at about corresponding temperatures, and the range of the lower critical concentration for any species did not appear to exceed 1 per cent as a rule. The range of the lower critical concentration of oxygen between the extremes of growing temperature for roots, and for any one species, about equals the differences in the oxygen-absorption capacity of water for the same temperature.

"A second cardinal oxygen concentration for root growth is such a partial pressure as will just permit a 'normal' rate of growth for any given temperature. With the temperature constant, an increase in concentration above such concentration will not induce an increase in the rate of growth. This is here referred to as the upper critical concentration of oxygen. It can also be termed the lower optimal partial pressure, and has a characteristic similar to the lower critical partial pressure for growth, in that its value is inversely related to temperature. The least upper critical concentration occurs at low temperatures and the greatest at high temperatures, but the range of the upper critical, for any species, may be from 2 to 8 per cent, more or less, and thus is much greater than the range of the lower critical concentration.

"The difference between the lower and the upper critical oxygen concentration for root growth is the range of the oxygen deficiency. This range is apparently specific and is directly related to the degree of aerobism of a species, being greatest in those most dependent on a good oxygen supply. . . . It is the rate of supply rather than the partial pressure per se of oxygen that influences the rate of growth. Thus, in species where the oxygen concentration was below the lower critical concentration and growth of the root would not continue with the experimental atmosphere static, it would begin if the gaseous mixture were caused to pass slowly through the soil. Further, . . . in parallel percentages of oxygen a mixture of nitrogen with oxygen is less efficient in influencing the rate of root growth than a mixture of oxygen with helium. . . .

"Mention should be made that oxygen may diffuse slowly into a sealed culture, although the seals may be sufficiently tight to prevent molar gas movements. This was found to be the case, with low partial pressure of oxygen in the soil, in several species, including cotton, corn, Potentilla, and onion. In bulbous forms, however, the inward diffusion was apparently between the scales, and also takes place where the leaf bases are closely pressed together, as in Potentilla. In such species sealing at the crown of the main root seemed to prevent the inward movement largely, or wholly. However, in many instances, as in cotton, where the leaves were not crowded at the base of the stem, there were indications of inward diffusion of oxygen. . . . In preliminary experiments looking to the further examination of the matter, it was learned that in darkness controls and cultures behaved in a similar way, but very often a greater percentage of oxygen was demonstrated in the culture tubes in plants which had been illuminated.

"A comparison of results indicates that there may often be a close relation between the degree of aerobism of a species and the occurrence of the species in a given habitat, although it has not been possible, for want of data on the oxygen content of the soil, to make the comparison with exactness."

The water relations of some Natal plants, with special reference to the leaves of "Ptaeroxylon utile" and "Portulacaria afra," J. W. BEWS and R. D. AITKEN (*So. Africa [Dept. Agr.] Bot. Survey Mem. 8 (1925), pp. 5–34*).—In a brief account which is given of the principal plant communities of the midlands of Natal, it is concluded that the physical differences between these communities are likely to have a considerable effect upon the water relations of the plants composing them. A method of determining the water-retaining power of the leaves of plants is described, and an account is given of the applications of this method, from the results of which it is possible to arrange the leaves in the order of their ability to retain water. This, however, is not considered sufficient evidence of the relative xerophytism of the plant as a whole. Results of studies on particular species are indicated.

The water requirement and transpiration of a common Natal weed, Bidens pilosa (L.), J. W. BEWS and R. D. AITKEN (*So. Africa [Dept. Agr.] Bot. Survey Mem. 8 (1925), pp. 41–65, figs. 15*).—In a study of *B. pilosa* it has been found that while differences in soil moisture content affect the growth and vigor of the plant they have no great effect on the water requirement. In one series of plants showing the most vigorous growth the lowest water requirement was found, this fact showing, apparently, that vigorous growth tends to economy of water. The effect of wind is to increase water requirement, though not proportionally to wind velocity or to increased evaporating power. The evaporating power of air can be increased up to 250 per cent with only a slight increase in the water requirement of the plants. Beyond that point a very marked increase in water requirement is shown. Seedling plants up to nine weeks

of age dried out at a very uniform rate. The actual amounts of water lost are more or less proportional to the weights of the plants or to their total water content. Plants at the flowering stage are more resistant to water loss, though the rate of loss again increases slightly at the seeding stage. In every case the most water was lost by the plants which received the most. Certain variations in the rate appear to be correlated not only with increase in size of the plants but with variations in the form of the leaves produced. Aside from discrepancies indicated, *B. pilosa* is deemed suitable for use as an indicator plant or phytometer.

Physiology of germination and of seedlings, L. KANZLER (*Beiträge zur Physiologie der Keimung und der Keimlinge. Diss., Hochsch. Landw. u. Brau., Weihenstephan, 1925, pp. 58, pls. 2, figs. 5*).—This dissertation is in two parts, dealing respectively with the physiology of germination in plants and with the experimental morphology and physiology of seedling leaves.

The influence of seed treatment with stimulating chemicals on germination and growth [trans. title], A. BECKER (*Landw. Jahrb., 63 (1926), No. 4, pp. 501–561, figs. 9*).—Accounts of the development of the concept of stimulation and of laboratory studies are followed by extensive data, conclusions, and discussion, with a bibliography of 79 titles.

Aseptic germination in the Orchidaceae: Symbiotic and asymbiotic cultures [trans. title], G. BULTEL (*Rev. Hort. [Paris], 96 (1924), Nos. 11, pp. 268–271; 12, pp. 291–294, figs. 5; 97 (1925), Nos. 13, pp. 318–321, fig. 1; 14, pp. 334–339, figs. 8; 15, pp. 359–363, figs. 5*).—A condensed historical and descriptive account is given regarding phases and facts observed in association between orchids and fungi, several of each being separately dealt with in this connection.

[**Asymbiotic germination in orchids**], G. BULTEL (*Rev. Hort. [Paris], 98 (1926), No. 6, p. 155*).—Facts cited are claimed to show that orchids may be germinated normally in the absence of fungi.

Asymbiotic life in orchids [trans. title], [J. COSTANTIN] (*Ann. Sci. Nat., Bot., 10. ser., 8 (1926), No. 3–6, pp. I–XVI, fig. 1*).—A somewhat critical survey of relevant facts and recent contributions is offered regarding certain statements, particularly referring to accounts by Bultel above noted.

The significance of tree-mycorrhiza.—An ecological-physiological study, E. MELIN (*Untersuchungen über die Bedeutung der Baummykorrhiza.—Eine Ökologisch-physiologische Studie. Jena: Gustav Fischer, 1925, pp. VI+152, figs. 48*).—Studies were made of *Pinus silvestris*, *P. montana*, and *Picea abies* and were begun on *Larix europaea* in an attempt to establish a vital significance for the mycorrhiza found in association with these plants on raw humus soils.

The cyclogeny of bacteria, G. ENDERLEIN (*Bakterien-Cyclogenie. Berlin: Walter de Gruyter & Co., 1925, pp. VIII+390, figs. 330*).—Utilizing the term cyclogeny of bacteria, credited to himself, as used in an earlier publication and defined herein to mean the cyclic course of morphological development throughout the summation of all generations from the simplest morphological unit to the highest morphological structure which occurs in a species, also, more briefly, as a potential, but in some sense also a shortened, alternation of generations and a recapitulation of phylogeny throughout the generations, the author deals in systematic form with the history and relationships of bacteria. The collection of papers is intended as an introduction to studies on the structure, sexual and asexual propagation, and development of bacteria.

Sexuality in the Basidiomycetes [trans. title], R. VANDENDRIES (*Cellule, 35 (1925), pp. 125–157, pls. 2, figs. 6*).—In *Coprinus radians* the spores of a given

carpophore belong to one or other of opposite sexes, though differing from the sexes as obtained from separate carpophores. No case of conjugation was found which could be explained on the hypothesis of multipolar sexuality.

Seeds and plants imported by the Office of Foreign Plant Introduction, Bureau of Plant Industry, during the period from [April 1 to December 31, 1924] (*U. S. Dept. Agr., Inventories Nos. 79 (1927), pp. 78; 80, pp. 34; 81, pp. 31*).—About 3,300 lots of seeds and plants are listed, with notes, as introduced during the nine months covered by these reports.

GENETICS

[Investigations in animal genetics at Carnegie Institution] (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 46–50, 51, 52, 53, 55, 56*).—The results of the following investigations with vertebrates are briefly noted:

Experimental modification of the germ plasm.—In checking the work of Bagg and Little (E. S. R., 52, p. 131), dealing with an experimental modification of the germ cells, E. C. MacDowell and Bagg have treated 3 sets of 4 male litter mates by exposing the scrotum to X rays for from 5 to 20 minutes and have tested the fertility of the treated males at intervals up to 11 days after treatment by mating them with females of known fertility. The results showed that 15 minutes' exposure reduced the fertility at once, followed by sterility within 2 weeks. A 10-minute dose was evidently close to the border line and may or may not affect fertility.

[*Alcoholizing mice*].—Studies of the effect of treating female mice with alcohol fumes sufficiently long to cause deep anesthesia were found by MacDowell to increase the number of corpora lutea produced in the ovaries. The numbers of pregnancies were decreased by this treatment, and there was a delay in the birth of first litters from treated mothers, as well as a longer interval between the first two litters. Further studies of treated and control females have shown that the numbers of corpora lutea increased with parity until about the fifth or sixth litter. Whatever the effect of alcohol treatment on the number of corpora lutea, the results indicate that it is indirect rather than specific.

In further studies it was found that prenatal mortality in treated females increased from the first to the sixth parity, thus cutting down reproduction after ovulation rather than lowering ovarian activity. Treating the fathers did not have a significant effect on prenatal mortality, but different strains of males showed significant differences.

The proportions of abnormal young in these experiments have not differed significantly from those produced by control animals. The types of abnormalities have also been similar to those which originated in the X-ray experiments of Bagg and Little.

Ovulation in pigeons.—O. Riddle has found that the calcium in the blood doubles in females at the ovulation period, but gradually decreases following the laying of the second egg. Early in the preovulation period a notable increase in the fat and phosphorus content of the blood also occurs.

Race differences in thyroid glands in pigeons.—In connection with the studies of the activity of the thyroid glands, Riddle has produced strains of pigeons having abnormally large and abnormally small thyroids by careful selection and inbreeding.

The thoroughbred horse.—In connection with the analysis of thoroughbred records, the relation of distance to speed has been corrected by the formula $x=10$ (0.088296.log y+1.9763), in which y equals the number of furlongs run

and *x* equals the mean time percentage increase per furlong, when the basic unit 1.00=10.62 seconds per furlong. Other studies have been related to the futurity index and the influence of weight carried on speed.

The development and morphology of the gonads of the mouse.—Part I, The morphogenesis of the indifferent gonad and of the ovary, F. W. R. BRAMBELL (*Roy. Soc.* [*London*], *Proc., Ser. B, 101* (*1927*), *No. B711, pp. 391–409, pls. 4*).—Histological studies are reported from the University College, London, of the developing gonads of 37 embryos from 18 pregnant mice killed at daily or half-daily intervals from the ninth to eighteenth day after coitus, which covers the period of differentiation of the gonads into ovaries or testes, and of the ovaries of 13 females varying in age from birth to maturity. The testes differentiate from 11.5 to 12 days after coitus by the down growth of connective tissue from the hilum, forming a continuous tunica albuginea and breaking the epithelial nucleus up into twisted spermatic cords. The differentiation of the ovary occurs at about 16 days after coitus, and oocytes were observed to degenerate at all stages after differentiation. Primordial germ cells evidently originate from the cells of the germinal epithelium, but this was not observed after birth.

Studies on the relation of gonadic structure to plumage characterisation in the domestic fowl.—II, The developmental capon and poularde, A. W. GREENWOOD and F. A. E. CREW (*Roy. Soc.* [*London*], *Proc., Ser. B, 101* (*1927*), *No. B 711, pp. 450–462, pl. 1*).—In continuing this series (E. S. R., 55, p. 431) the authors describe 11 birds which were observed to exhibit throughout their life the characters and behavior of individuals completely gonadectomized before puberty, with the single exception that the combs, though small, always maintained a bright and healthy appearance. A complete absence of, or extreme reduction in, the size of the gonads in all of these fowls was observed on post mortem, and when gonadic tissue was present gametogenesis was imperfect. Possible explanations of this are discussed.

The giant cells in the placenta of the rabbit, G. S. SANSOM (*Roy. Soc.* [*London*], *Proc., Ser. B, 101* (*1927*), *No. B 710, pp. 354–368, pls. 9*).—Studies of placentation in the rabbit from the University College, London, have shown the presence of two kinds of giant cells in the pregnant uterus. The larger ones, attaining as much as 0.4 mm. in length, are derived from the fetal trophoblast. The mesometrial giant cells, however, are of maternal origin.

Cytological investigations of the genus Malus (preliminary account) [trans. title], V. A. RYBIN (*Trudy Prikl. Bot. i Selek.* (*Bul. Appl. Bot. and Plant-Breeding*), *16* (*1926*), *No. 3, pp. 187–200, figs. 19; Eng. abs., pp. 199, 200*).—Studies at the Institute of Applied Botany, Leningrad, upon the chromosomes in active, growing root and shoot tips of various species of apples, including a cultivated variety, showed a uniform count, 34 diploid, in all species from Europe and continental Asia and in one species from Japan and one from America. Other species, including two from Japan and one from America, had chromosomes ranging from 64 to 71 in diploid number. Incidentally, all three of these aberrant species bore lobed leaves entirely or in part. No consistent differences were noted in the size or the shape of the chromosomes between the several species.

An examination of three species of pears and one of quince showed 34 diploid chromosomes. The close resemblance in general appearance between apple and rose chromosomes is commented upon.

Genetic evidence of a selective segregation of chromosomes in Sciara (Diptera), C. W. METZ (*Natl. Acad. Sci. Proc., 12* (*1926*), *No. 12, pp. 690–692*).—The results of crosses in Sciara involving the wild and truncate charac-

ters are presented. These results deviate widely from those expected on the basis of ordinary Mendelian inheritance. The deviations are explained as due to the selective segregation of chromosomes previously observed in cytological studies (E. S. R., 55, p. 819).

A contribution to the genetics of pointed cap and round cap in pigeons [trans. title], E. SÖDERBERG (*Hereditas, 8 (1927), No. 3, pp. 363–366, fig. 1*).—The results of a few matings have indicated that the types of head feathering designated as pointed cap in the Kupfergimpel and round cap in Swedish Tumblers and Norwegian Petents are recessive to the normal. Round cap is dominant to the pointed cap condition.

Color in relation to health of wild and domestic animals, S. HADWEN and E. L. HARRINGTON (*Jour. Heredity, 17 (1926), No. 12, pp. 450–461, figs. 8*).—The relative value of different coat colors on animals is discussed, with observations and references from many sources. It is pointed out that colored animals are usually more likely to survive than white or spotted animals, except in the Arctic regions where white seems to be a favorite color for winter.

Some numerical results of selection upon polyhybrids, C. ZIRKLE (*Genetics, 11 (1926), No. 6, pp. 531–583, figs. 3*).—The author has developed formulas to indicate the proportions obtained in various generations from a polyhybrid population of *m* allelomorphs resulting from the elimination in each generation of all of the individuals as follows: (1) Those dominant for all of the *m* independent factors, (2) those not dominant for all of the *m* independent factors, (3) those recessive for all of the *m* independent factors, and (4) those containing two or more or three or more independent dominant factors.

Studies on pollen tube development in a partially sterile hybrid between Linaria vulgaris and L. purpurea, R. A. BRINK (*Ztschr. Induktive Abstam. u. Vererbungslehre, 44 (1927), No. 2, pp. 129–148, fig. 1*).—The partially sterile hybrid *L. vulgaris* × *L. purpurea* produced about 28 per cent normal appearing pollen grains, F_2 plants derived therefrom by self-pollination 67, and *L. vulgaris* over 95 per cent, of which 23, 41, and 71 per cent, respectively, germinated. The observations suggested that in partially sterile plants elimination of unbalanced combinations of genes apparently occurs at various stages in the reproductive cycle. Evidence presented indicates that the growth attained on artificial media, as measured by pollen tube length, is so influenced by factors peculiar to these substrates that little can be inferred from the results as to the probable behavior of corresponding individuals in the style of the plant. This conclusion does not apply to germination.

Graft hybrids in plants, C. F. SWINGLE (*Jour. Heredity, 18 (1927), No. 2, pp. 73–94, figs. 6*).—This paper, accompanied by a comprehensive bibliography, is essentially a summary of the present knowledge and theories of the nature of graft hybrids.

On the effects of unilateral ovariotomy and salpingectomy in the rat, F. A. E. CREW (*Biol. Gen., 3 (1927), No. 1–2, pp. 207–212*).—In studying the effect upon litter size and migration of the ova in rats at the University of Edinburgh, unilateral salpingectomy and ovariotomy were performed, respectively, on 2 lots of 10 individuals each. In another similar lot the ovaries on one side and a portion of the oviducts on the opposite side were removed, while in 5 other animals the ovary and a portion of the oviduct were removed from the same side.

The results of the combined studies showed no evidence to indicate either external or internal migration of ova in the rat. The litter size of controls, 6.28 ± 0.22, was not significantly different from that of the females having one

ovary removed (6.02±0.27). The remaining ovary was considerably hypertrophied. Where unilateral salpingectomy was practiced, the mean litter size, 3.68±0.25, was about one-half of that of the controls. When the ovary and oviduct were removed from the same side, the litter size averaged 5.98±0.13, which was not significantly different from the controls. None of the rats having a portion of the oviduct from one side and the opposite ovary removed became pregnant during 6 months, though coitus occurred and corpora lutea were found in the remaining ovary, which was considerably hypertrophied.

Ovarian regeneration in the mouse after complete double ovariotomy, A. S. Parkes, U. Fielding, and F. W. R. Brambell (*Roy. Soc. [London], Proc., Ser. B, 101 (1927), No. B 710, pp. 328–354, pls. 2*).—Observations on the oestrous histories of 121 double ovariectomized mice showed that 11 of these individuals, though showing no signs of oestrum for a period longer than could be accounted for by an unusually long dioestrum, again showed the recurrence of the phenomenon at a later date. Histological examination of the ovarian tissue removed from 6 of the animals demonstrated that all the ovarian tissue had been taken from 5. After the recommencement of the oestrous cycle in the 11 animals the presence of ovarian tissue was demonstrated in 8 of them, which is considered the result of regeneration rather than hypertrophy of fragments left at the time of operation.

The time required after double ovariectomy for the spontaneous appearance of the oestrum varied in the different individuals from 12 to 113 days. Most of the subsequent cycles were relatively regular. Follicles and corpora lutea were found in most of the regenerated ovaries, but in 1 or 2 animals the cyclic changes did not appear to be associated with the maturation of the follicles.

On the effect of the ovarian hormone in producing pro-oestrous development in the dog and rabbit, S. A. Asdell and F. H. A. Marshall (*Roy. Soc. [London], Proc., Ser. B, 101 (1927), No. B 708, pp. 185–192*).—In experiments at the Institute of Animal Nutrition, Cambridge, 5 bitches in a state of anoestrum and 1 immature and 1 mature spayed rabbit were injected daily for from 5 to 10 days with that portion of the liquor folliculi, chiefly from pigs' ovaries, which was soluble in 95 per cent alcohol. The injected bitches and does refused to mate with males, but histological examinations of the vaginas of the bitches showed that a growth of the resting vaginal epithelium from the double layer to a stratified epithelium of from 10 to 12 cells thick had occurred and in the bitches injected for 10 days cornification was advanced. The uteri of the dogs and rabbits showed typical prooestrous changes, but the vulva did not show the prooestrous swelling, nor was there any apparent effect on the follicular system of the ovary. It is suggested that a further factor than the follicular hormone may be necessary for the actual production of oestrum.

Studies on the oestrous cycle in the rat.—III, The effect of low environmental temperatures, M. O. Lee (*Amer. Jour. Physiol., 78 (1926), No. 2, pp. 246–253*).—In continuing this series of studies (E. S. R., 55, p. 860), one group of animals was kept indoors where the temperature averaged 22° C. (71.6° F.), while another group was kept outdoors where the temperature went as low as —15° and averaged 2 to 3° for approximately two months of the period from November 23 to March 1 during which the animals were under test. The cycles of the rats kept indoors, as determined by vaginal smears, averaged 4.8 days in length, while those kept outdoors averaged 8.6 days. The average length of the cycles during the outdoor period varied roughly with the fluctuations in the temperature, which were somewhat lasting. The body temperature of the rats also fluctuated with the environmental temperature.

The relative proportion of the sexes in animals, with particular reference to mollusks [trans. title], P. Pelseneer (*Acad. Roy. Belg., Cl. Sci. Mém.,*

8 (1926), No. 11, pp. 258, figs. 6).—The author has presented data from all available sources on the sex ratio in the different species of mollusks and vertebrates, and discusses from the data presented the relation of various factors, i. e., age, temperature, hybridization, season, etc., to the sex ratio in certain of the species. A very extensive bibliography is included.

The influence of nutrition on fertility and especially on twinning in humans [trans. title], H. W. Siemens (*Arch. Rassen u. Gesell. Biol., 18 (1926), No. 4, pp. 426–431*).—Data showing the total number of births and the numbers of twins, triplets, and quadruplets born annually in Germany from 1907 to 1921 reveal no significant difference in the percentage of multiple births during the war, and especially during 1916 and 1917 when the food supply was estimated at 60 per cent. This does not support the theoretical relation of the food supply to the prevalence of multiple births.

FIELD CROPS

Variation in plot yields due to soil heterogeneity, F. A. Wyatt (*Sci. Agr., 7 (1927), No. 7, pp. 248–256, figs. 3*).—Data obtained at the University of Alberta from 124 1/40-acre untreated plats producing Victory oats in 1925 and Marquis wheat in 1926 suggest that variations in the yields from plat to plat could be attributed to soil heterogeneity. The extreme variations in the yields of oats and wheat were 48.6 and 16.4 bu., respectively, or variations from the means of 55 and 32 per cent. The greatest variation for adjacent plats was 22.9 bu. for oats and 4.9 bu. for wheat; in terms of the means, 26 and 15 per cent. The data seemed to show the need for systematic performance tests for plats intended for rotation, fertilizer, or variety yield experiments and to avoid drawing sweeping conclusions regarding fertilizers or varieties from the results of a limited number of especially small plats and of a few years. Earlier work by others is reviewed briefly.

[Agronomic work in New Mexico] (*New Mexico Sta. Rpt. 1926, pp. 15, 16, 42–46, 55, 56*).—Further experimental activities (E. S. R., 55, p. 433) reported on comprised varietal trials with winter and spring wheat, oats, and barley, corn, cotton, alfalfa, and tobacco, control of Johnson grass, breeding work and seed production tests with sugar beets, a fertilizer trial with alfalfa, and studies of growth and reproduction of chamiza (*Atriplex canescens*).

A fertilizer test indicated that on the heavier types of soils not too heavily cropped to cotton commercial fertilizer would not give profitable returns, especially if barnyard manure had been applied or the cotton followed alfalfa. On lighter soils 300 lbs. of acid phosphate to the acre was more profitable than the application of a 12–4–4 mixture. Neither ammonium sulfate nor a 12–4–0 fertilizer yielded increase enough to pay for their costs. A pile of cotton seed exposed to the weather from November 5, 1925, to March 22, 1926, shrunk about 5.5 per cent, while cotton seed stored in sacks under shelter shrunk about 1.2 per cent.

Analyses of cotton seed grown in the State showed that immature seed is low in both protein and oil. Acala seed ran as high as any variety in oil and sometimes as high in protein. No correlation could be noted between the quantity of irrigation water used and the composition of seed. New Mexico seed compared favorably with reports on seed from other localities. Samples of cottonseed cake and meal ranged from 39.4 to 45.5 in percentage of protein. The delinted seed contained from 5.5 to 10.1 per cent of water, 19.5 to 25.4 per cent of protein, 20.1 to 25.9 per cent of oil, 13.6 to 20.3 per cent of crude fiber, 22.1 to 31.4 per cent of N-free extract, and from 3 to 4 per cent of ash.

[Agronomic work in California] (*California Sta. Rpt. 1926, pp. 37–40*).—Further studies (E. S. R., 55, p. 331) by P. B. Kennedy dealt with *Trifolium* and *Physostemium* spp. (bladder clovers), Harding grass, *Phalaris* spp., bulbous bluegrass (*Poa bulbosa vivipara*), and Zawadke grass (*Puccinellia nuttalliana*). Planting tests with summer legumes are reported by B. A. Madson, and harvesting and spacing studies with grain sorghums by J. P. Conrad, and a study by G. W. Hendry of plant material found in adobe bricks of historic buildings are noted briefly.

In experiments in different parts of California uniformly higher yields were obtained from early spring planting than from either late spring or fall planting for all varieties of mangels, carrots, turnips, and rutabagas. The choice of variety is also an important factor in determining yield, both with respect to locality and season of planting. Wide differences were found to exist between different varieties in these tests as sources of vitamin A. The Yellow Giant carrot and the Danvers Half-long carrot proved to be rich sources, while the White Belgian carrot and several varieties of mangels, turnips, and rutabagas were almost vitamin-A free.

According to tests by J. W. Gilmore, normal California cotton is a little higher in tensile strength than southern cotton as reported by published data. *Vicia calacrata* sown in standing cotton after the first picking in October at the Imperial Valley Substation yielded on hard land 12 tons of green manure per acre by February 15, and the cotton crop following this vetch plowed under showed improvement in size of plants and bolls.

Gilmore determined that pistillate hemp (Cannabis) plants produce a somewhat better fiber than staminate plants, probably because staminate plants mature more quickly. Medium sized plants (about 0.5 in. in diameter) produce a larger percentage of fiber than larger or smaller plants. Fiber quality deteriorates rapidly between the full bloom period and full maturity, the deterioration being faster in staminate than in pistillate plants.

From studies with cereal varieties W. W. Mackie reported that Pusa 4, a drought-resistant early maturing wheat, appeared to possess the best milling qualities. Escondido, a Defiance selection, is very resistant to stem rust, and Little Club-Fretes×Mexican yielded highest at Davis. Hard Federation×Bunyip B 537, apparently the earliest and most drought resistant wheat, matured earlier than either parent.

The long-kerneled rices seemed adapted to the climatic and soil conditions of the Imperial Valley. Analyses of commercial samples of barley collected in many parts of California, in cooperation with the U. S. Department of Agriculture, revealed that Coast barley has a higher nitrogen content than Club Mariout, indicating that the latter should be the more satisfactory in that respect as a brewing barley.

[Field crops investigations in Georgia, 1926] (*Georgia Sta. Rpt. 1926, pp. 121–123, 125–128*).—Prominent in continued variety tests (E. S. R., 55, p. 131) were selections of Purplestraw wheat, Texas Rustproof oats, Tennessee Winter Beardless barley, rye of the Abruzzi type, Cook 588, College No. 1, and Coker Foster No. 2 cotton for yields and Delfos 6102, Deltatype No. 5, Super Seven, and Lightning Express in value of lint.

Fertilizer tests with corn indicated that nitrogen is the main limiting factor, potash and phosphate having much lesser effects. The cornstalk method of determining fertilizer needs seemed to show that potash becomes the second limiting factor when corn yields go above 35 bu. per acre.

Except for weed removal, cultivation did not appear to benefit cotton. Close, 4- to 8-in., spacing resulted in maximum yields. Seed cotton yields

rose with increase in the quantity of sodium nitrate applied. Top-dressings of sodium nitrate at planting or chopping did not differ much in results, while application at squaring was followed by an acre loss of 150 lbs. of seed cotton. Comparisons were also made of nitrogen sources and home-mixed v. factory-mixed fertilizers for cotton.

[**Field crops work at the Morris, Minn., Substation, 1926**], P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1926, pp. 14, 15, 21-36*).—Continued investigations (E. S. R., 56, p. 524) reported in detail and summary form included crop rotations, varietal trials with spring and winter wheat, oats, barley, rye, flax for seed, field peas, corn, and alfalfa, and trials of cereal-flax mixtures. Fertilizer tests with alfalfa demonstrated that either barnyard manure or acid phosphate, each used alone, appears to be the best fertilizer for alfalfa land in western Minnesota.

[**Field crops investigations in North Carolina, 1925–26**], C. B. Williams, E. G. Moss, P. H. Kime, and C. D. Matthews (*North Carolina Sta. Rpt. 1926, pp. 18, 20, 28, 29, 52–54, fig. 1*).—Storage tests demonstrated that the sweet potato storage houses in eastern North Carolina can be used successfully to keep early crop Irish potatoes through the summer until October. North Carolina mountain-grown seed has equaled Maine-grown seed for use in eastern North Carolina. Closer spacing within and between rows produced heavier yields in seasons with normal moisture, but reduced yields were indicated in dry seasons. A complete fertilizer has given the most profitable returns on the Mountain Substation. Among sources of potassium used therein, the sulfate and chloride gave similar results, both surpassing kainit. Lime has not been profitable with potatoes.

Planting 12 in. apart in the row gave higher yields of sweet potatoes than wider distances and produced roots more uniform in size and shape. Storage trials showed that if sweet potatoes remain in the ground until the vines have been killed by frost and the roots are affected by low temperatures they will not keep successfully in storage. Ammonium sulfate gave a better yield than sodium nitrate or tankage as nitrogen sources in 8–3–6 fertilizer.

Tobacco on plats at the Tobacco Substation not supplied with magnesia from magnesian limestone or other sources was noticeably affected with sand drown. Close spacing, 1 ft. apart in 4-ft. rows, of tobacco on land too rich in nitrogen for the crop appeared to be a means of avoiding coarse, rough leaf with other objectionable qualities.

Natural cross-pollination between pure purple- and white-flowered strains of soy beans was calculated to be 0.0546 per cent for plants in the same hill and 0.072 per cent with the two strains in alternate rows. Monofactorial segregation was observed regarding flower color, purple being dominant.

Trials of crimson clover seed from American and European sources indicated that southern-grown seed is safer than imported seed, although Czechoslovakian seed have shown up well.

Summary of results of experiments conducted in field crops and soils at the Panhandle Agricultural College, Goodwell, Okla., 1926 (*Oklahoma Sta. Bul. 160 (1927), pp. 15*).—Agronomic work reported under the supervision of H. H. Finnell at Goodwell in the Oklahoma Panhandle comprised improvement work with barley, corn, and grain sorghum; variety trials with winter and spring wheat, rye, and barley, oats, corn, grain sorghum, sorgo, broomcorn, cotton, cowpeas, soy beans, mung beans, and miscellaneous grasses and legumes; cultural (including planting) tests with grain sorghum, cotton, and wheat; and crop rotations. Meteorological data and notes on soil management abstracted on page 214 are included.

The correlation between climate and the yield of farm crops in Prince Edward Island, J. A. Clark (*Sci. Agr., 7 (1927), No. 7, pp. 261–267, figs. 4*).—An investigation at the Dominion Experimental Farm at Charlottetown showed that an average mean temperature for March in Prince Edward Island has usually been followed by a normal spring and farm crop yields close to the average of many years. A high March temperature and an early spring have been followed by greatly reduced yields, declining in some cases to less than 90 per cent of all crop averages. A low mean temperature for March has been followed by a late spring and greatly increased yields, amounting to as much as 5 per cent above the normal of all crop averages. This correlation promises to be of value in selecting crops to suit the season, the corn crop being practically assured after a high mean temperature in March. Other crops should replace corn in Prince Edward Island when March is cold.

[**Agronomic and plant breeding work of the Landsberg, Prussia, Experiment Station**], G. Bredemann et al. (*Landw. Jahrb., 64 (1926), Ergänzungsb. 1, pp. 20–24, 28, 29–33, 38–58, 95–98, 115–143, figs. 10*).—Experiments reported in these pages were concerned with the influence of fertilizers on the starch content of potatoes, nitrogenous fertilizers for alfalfa, seeding rates with corn, oats, and rye, the sugar loss in topped beets, the influence of height of water table on productivity of grasses and clovers, the water requirements of grasses, fertilizers for meadows, grasses and red clover from different sources, and the relative merits of varieties and strains of wheat, barley, rye, oats, corn, field peas, lupines, soy beans, flax, hemp, potatoes, sugar beets, fodder beets, and tobacco.

[**Agronomic investigations of the Agricultural Research Institute, Pusa, 1925–26**], W. H. Harrison, W. McRae, F. J. F. Shaw, J. N. Mukerji, T. S. Venkatraman, and K. D. Naik (*Agr. Research Inst., Pusa, Sci. Rpts. 1925–26, pp. 3, 7, 8, 13–24, 31, 32, 185–207*).—The research and breeding work reported in these pages was similar in scope to and continued previous experiments (E. S. R., 55, p. 229).

Breeding of Hungarian alfalfa [trans. title], R. Fleischmann (*Ztschr. Pflanzenzücht., 11 (1926), No. 3, pp. 211–240, figs. 9*).—This account of breeding work with alfalfa at the experiment station at Kompolt, Hungary, records observations on blooming and seed production, describes work with different lines of alfalfa, and comments on vegetative propagation, artificial self-pollination, and seed production of cultivated plants.

Curing alfalfa hay, T. A. Kiesselbach and A. Anderson (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 116–126, figs. 6*).—Investigations made at the Nebraska Experiment Station from 1921 to 1926 demonstrated that windrowing and cocking relatively green alfalfa hay materially extended the curing period as compared with swath curing. Prolonged swath curing resulted in undue loss of leaves and bleaching. Judicious partial swath curing to hasten the rate of drying, followed by windrowing and prompt storage when cured, appeared to be the best farm practice for the region. The normal transpiratory function of the leaves of cut alfalfa was found to be a negligible factor in the curing process.

The field carrot: Its place in Quebec's agriculture, G. A. Langelier (*Canada Expt. Farms Circ. 51 (1927), pp. 4*).—A summary account of trials of varieties and strains of field carrots at the Cap Rouge Experimental Station, with notes on the growing and feeding of carrots. Mangels and swedes yield better and are more suitable for feed for livestock than carrots.

Cotton, H. B. Brown (*New York and London: McGraw-Hill Book Co., 1927, pp. XI+517, pl. 1, figs. 140*).—This book endeavors to summarize information

on the most important aspects of cotton and the cotton industry, the material applying especially to the upland cotton district of the American Cotton Belt. A brief historical survey is followed by a discussion of the cotton plant in various relationships—its botanical species, agricultural varieties, morphology, physiology, reproduction, and heredity, and a discussion of subjects relating to cotton production—cotton breeding, fertilizers, soils, climate, culture, diseases, harvesting, and ginning. Phases of cotton marketing—classing, cotton marketing proper, and cotton exchanges—are reviewed, and the products and uses of different parts of the cotton plant are discussed. Concluding chapters deal with uses and spinning qualities of various kinds of cotton, making cotton cloth, and cotton statistics.

[Cotton research in North Carolina], C. B. WILLIAMS, R. Y. WINTERS, ET AL. (*North Carolina Sta. Rpt. 1926, pp. 14, 15, 21-28, figs. 2*).—Storage of seed cotton from October 2, 1925, to February 23, 1926, in a cooperative study with the U. S. Department of Agriculture by P. H. Kime, F. E. Rice, and H. H. Willis, did not change the weight, ash, or moisture content of the fibers, nor were the grade and staple influenced thereby. Breaking tests (E. S. R., 56, p. 496) indicated a slight increase in strength due to storage but when converted into yarn strength the increase was very small. The changes induced by storage in these tests did not seem to warrant the expense and risk of storing seed cotton on the farm for the purpose of improving its quality.

In a study of the inheritance of the fuzzy seed coat of cotton and its relation to lint production, the lack of fuzz covering on cotton seed appeared to be a simple Mendelian character dominant to the fuzz covering.

Investigation of the fiber distribution on the seed coat of cotton by Winters and J. H. Moore showed venation of the seed coat to be similar although not identical with that of the leaves of the same plant. The mode of branching among the primary veins of the seed coat varied more than in the leaf. Variation in mode of branching of primary veins was not accompanied by variation in distribution of fibers. In all material studied a thinner population of fibers occurred near the pointed end of the seed and along a narrow strip immediately adjoining the funiculus. Beginning with the micropyle end the fiber population is thinner, becoming thicker toward the calazal region and densest around the point of branching of the primary veins. Proximity to the main food channels seemed partly responsible for the greater population in the areas mentioned. More stomata were found in the area of the greatest fiber population.

Winters and R. C. Campbell investigated the relation of the percentage of undeveloped fibers (said to be a cause of uneven dyeing of cotton cloth) to their position on the seed coat, to the location of seeds in the lock, and to the location of bolls on the plant. The percentage of undeveloped fibers appeared greatest at the rounded end of the seed, becoming fewer approaching the pointed end. This, together with the above study on fiber distribution, suggested that the percentage of undeveloped fibers rose as the density of fiber population increased. Variation in length of staple on a single seed or plant may also have an influence in this respect, the area of longer fibers being associated with a greater percentage of undeveloped fibers. Continuous selection for high lint percentage should evidently be made with caution to avoid a concurrent increase of undeveloped fibers. Observations in different zones of the cotton plant revealed the smallest percentage of undeveloped fibers at the lower and inner bolls of the plant, whereas the percentage increased in bolls toward the outer and upper portions of the plant, indicating the advisability of keeping separate the different pickings in order to obtain uniform samples.

Sodium nitrate was found the most efficient nitrogen carrier for cotton, surpassing ammonium sulfate, dried blood, calcium cyanamide, and tankage

in the order named. Neither varying the amount of phosphoric acid from 6 to 12 per cent in a mixture with 4 per cent of ammonia and 3 of potash at the acre rate of 800 lbs., nor varying the potash percentage from 2 to 6 in a mixture with 10 per cent of phosphoric acid and 4 of ammonia materially affected yields of cotton at the Upper Coastal Plain Branch Station. Of a 10-4-3 mixture, 800 lbs. per acre gave a larger yield than 400, 600, 1,000, or 1,200 lbs.

Influence of fertilizer treatments on stand or germination of cotton, G. W. Musgrave and D. G. Coe (*Jour. Amer. Soc. Agron.*, *19* (*1927*), *No. 2*, *pp. 171–180*, *figs. 2*).—Experiments in North Carolina and Oklahoma were concerned with the effects on the stands of cotton of nitrogen salts at different rates and times of application, potassium, and phosphorus, and of different methods of applying fertilizers.

Applications made under the seed along the row, a method common in practice, inhibited the germination of cotton. The effect appeared to be more pronounced from nitrogen and potassium salts than from phosphorus. Such inhibition increased with increasing quantities of nitrogen from all sources, and was more marked with applications at planting than with those made before planting. Several methods of locating the fertilizer with reference to the seed gave results fully equal to the unfertilized checks. Direct contact applications in concentrations of fertilizers immediately below the seed were found inferior. From the viewpoint of seed germination, application at the side of the seed row, within the cotton bed, and at about the seed level seemed especially worthy of consideration.

Making cotton cheaper: Fertilizer experiments 1921–26, Delta Branch Station, W. E. Ayres and H. A. York (*Mississippi Sta. Circ. 71* (*1927*), *pp. 7*).—Fertilizer experiments with cotton (E. S. R., 55, p. 334) continued to show that Delta soils respond profitably to nitrogen only, although acid phosphate should be used on Delta soils made directly from the hills. Ammonium sulfate and sodium nitrate have been similar in effectiveness. Cottonseed meal, if as cheap per pound of nitrogen, seemed as economical as other nitrogen sources. From 150 to 200 lbs. of sodium nitrate or its equivalent in ammonium sulfate is indicated for average Delta soils, all of the fertilizer to be applied at or before planting. Several commercial nitrogenous fertilizers have given good results during 2 years. Increases in the second cotton crop following soy beans in corn amounted to 13 per cent in 1926.

The climate of the southern Sudan in relation to cotton growing, R. A. Wardle (*Mem. and Proc. Manchester Lit. and Phil. Soc.*, *70* (*1925–26*), *pp. 59–69*, *figs. 3*).—Consideration of cotton production conditions in the southern Sudan, Uganda, Northern Nigeria, Egypt, and the Cotton Belt of the United States led to the conclusion that while climatic conditions in the rainfall area of the Sudan are favorable to cotton growing, they are not suitable everywhere to the cultivation of cotton stapling over 25 mm. (over 1 in.), and increased production of this class of cotton is to be looked for in the future in the districts lying on the northern slope of the Congo-Nile divide, such as the Meridi, Yambio, and Tembura districts of Bahr-el-Ghazal Province, and the Yei-Opari districts of Mongalla Province, rather than in districts where cotton growing is at present on a commercial scale. The southern Kassala cotton growing districts, however, can probably produce much more of this type of cotton than they are producing at present.

Cotton varieties for southeast Missouri, B. M. King (*Missouri Sta. Bul. 249* (*1927*), *pp. 8*, *figs. 3*).—Varietal tests in four soil regions of the southeast Missouri lowlands during three years showed that Delfos cotton excelled on clay loam and heavy loam, Acala did well on the lighter soils, and Express had

a wide range of adaptation to different soil conditions. Trice has certain merits but did not show up well in the yield trials.

Primitive cottons in Mexico, O. F. COOK and J. W. HUBBARD (*Jour. Heredity, 17 (1926), No. 12, pp. 462–472, figs. 6*).—Five species of cotton plants described as new and obtained in northwestern Mexico include *Gossypium morrilli, G. dicladum, G. hypadenum, G. patens, and G. contextum. G. davidsoni* was found in abundance near Guaymas, growing as a wild plant among other desert vegetation.

The mixing of cotton varieties, A. HOWARD and S. C. TALESARA (*Agr. Jour. India, 22 (1927), No. 1, pp. 61, 62*).—Observations at Indore showed that contamination of the soil with cotton seed used for feeding work cattle and seed left on the land from a previous crop may be responsible for admixture. Crushing or boiling cotton seed before feeding is advised for stations and seed farms concerned with cotton improvement and pure seed production.

Length of fibre and ginning percentage in Indian cottons, R. PRASADA (*Agr. Jour. India, 21 (1926), No. 6, pp. 433–446, pls. 5; also in Indian Textile Jour., 37 (1927), No. 437, pp. 170–176, figs. 6*).—Studies on samples from growers in the United Provinces and on the progeny of hybrids between high ginning short staple and low ginning long staple cotton plants indicated that by selection staple length and ginning percentage do not permanently retain high values. Hybridization was more promising for combination of the two characters. The ginning percentage appeared to rise with an increase in the number of fibers per seed and with a decrease in length of staple.

A spacing experiment with flax [trans. title], A. STROBEL (*Faserforschung, 5 (1926), No. 4, pp. 227–238*).—Observations at the Munich Technischen Hochschule on flax plants at spacings from 9 to 108 sq. cm. (1.4 to 16.7 sq. in.) showed that with increase in spacing rose the total yield, the weight of stalk, seed, capsules, and roots, number of shoots and capsules, thickness of stalk, wood and pectin content, and duration of growth, whereas decreases were noted in length of stalk to first branch, grain and straw yield per unit area, oil content, and fiber and water content. The degree of correlation between individual characters was not influenced.

The influence of seeding rate and size of stem on flax fiber [trans. title], W. MÜLLER (*Faserforschung, 5 (1926), No. 4, pp. 239–255, pls. 2*).—Measurements by the author showed that the weight of the flax stems rose regularly with increase in diameter, whereas the bast percentage decreased very slightly. Flax with stems from 1.3 to 1.7 mm. appeared to be most profitable, since the arrangement of the fiber bundles occasioned the least fiber loss. Noticeable differences in fiber dimensions were not observed in stems of different diameters. The higher contents of fiber accompanied the greater radial expansion of the fiber bundles. While the number of fiber bundles was greater in the larger stems, no loss in strength accompanied increase in stem diameter.

"Bolting" in mangolds and sugar-beet, J. A. VOELCKER (*Jour. Min. Agr. [Gt. Brit.], 33 (1927), No. 10, pp. 889, 890*).—Analyses at Woburn Experimental Farm showed that in comparison with sound roots sugar beets bolted late in growth had 2 per cent more water, slightly more fiber and ash, and a sugar loss of 1 per cent. Bolted mangels gained slightly in fiber and lost 1.4 per cent of sugar. Unless bolted sugar beets suffered visibly in size their exclusion from the factory seemed hardly warranted.

Varieties of early potatoes [trans. title], H. H. WICK (*Jour. Landw., 74 (1927), No. 4, pp. 241–300, figs. 2*).—The stem, leaf, flower, tuber, and general plant characters are described, and in many cases the variability is indicated as a result of studies on over 70 German varieties of potatoes at the University of Göttingen. A determinative key is included.

Rice seed-testing, S. K. Mitra and P. M. Ganguly (*Agr. Jour. India, 21 (1926), No. 6, pp. 421–428, figs. 3*).—Aus varieties of rice in Assam (E. S. R., 53, p. 137) retained germinability even into the second year, while Sail and Asra rices germinated well only during the first year. Fresh seed germinated sooner than old seed. Sail rices required from three to four months resting period, whereas Aus varieties may germinate completely in less than two months after harvest.

The optimum spacing for the modern sugar beet [trans. title], J. Urban and J. Souček (*Ztschr. Zuckerindus. Čechoslovak. Repub., 51 (1926), Nos. 11, pp. 81–86; 12, pp. 93–99, fig. 1*).—In 27 spacing tests in Czechoslovakia in 1914 and in 1919–1924 sugar beets were grown at 30 cm. (11.8 in.) distances in rows 35, 40, 45, 50, and 55 cm. apart. While optimum sugar yields were obtained in 40-cm. rows, the slight reduction met with in 50-cm. rows would not be objectionable with proper cultivation, seeding time, and varieties. Beets in the 50-cm. rows averaged 0.25 per cent less in sugar and 33.5 per cent more in weight of individual roots than in the 40-cm. rows.

Causes of increased yields of sugar beets following applications of barnyard manure, D. W. Pittman and J. F. Fonder (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 167–170*).—Sugar beets grown continuous and in rotation at the Utah Experiment Station received manure at different rates and at different times. Considering the organic matter, total nitrogen, and nitric nitrogen in soil samples from the several plats, together with the manure applications and the beet yields, the most appreciable correlation was observed between the yield and nitric nitrogen in the spring and summer yield and total nitrogen, low correlation between yield and organic matter or apparent specific gravity, and practically none between yield and fall nitrifying power or carbon-nitrogen ratio. The results suggested that on the soil used, farm manure is valuable to sugar beets for the nitrogen contained rather than for its organic matter or its physical or bacteriological effects on the soil.

A method for controlling pollination of sugar beets, G. Stewart and D. C. Tingey (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 126–128*).—An account of the production of self-pollinated seed of sugar beets at the Utah Experiment Station where one or more branches were inclosed in each of from 5 to 10 2-lb. paper bags on each plant.

Windrowing of sugarcane, J. N. Mukerji (*Agr. Research Inst., Pusa, Sci. Rpts. 1925–26, pp. 30, 31*).—Sixty-six per cent of the buds of sugar cane windrowed (E. S. R., 55, p. 232) in the shade for 4 weeks germinated within 42 days. Sets of both fresh and windrowed cane germinated quicker when given a preliminary soaking in water. Analyses showed sugar cane grown from sets of windrowed cane to be as good as fresh cane or as cane produced from sets of fresh cane, demonstrating that windrowed cane can be utilized for seed purposes. The cane yield of sets from fresh cane subjected to preliminary soaking in water for 24 hours was 21.3 per cent more than yields from unsoaked cane.

Cane fires, J. S. B. Pratt, Jr. (*Assoc. Hawaii. Sugar Technol. Rpts., 4 (1925) pp. 107–112; also in Internatl. Sugar Jour., 28 (1926), No. 332, pp. 420–424*).—A discussion of the damage and deterioration caused by sugar cane fires and suggested means for their prevention and control.

Sweet clover, C. J. Willard (*Ohio Agr. Col. Ext. Bul. 55 (1926), pp. 20, figs. 12*).—Practical information is given on kinds of sweet clover (E. S. R., 47, pp. 136, 137) and ways of handling the crop for hay, pasture, soil improvement, seed, and other purposes.

Tobacco-growing in southwestern Ontario, D. D. DIGGES (*Canada Dept. Agr. Bul. 76, n. ser. (1927), pp. 29, figs. 13*).—Investigations with tobacco carried on during 10 years at the Dominion Experimental Station, Harrow, Ontario, and summarized in this report have been largely noted from other sources (E. S. R., 56, p. 638), and dealt with plant beds, rotations, soil preparation, transplanting, cultivation, topping, control of insects and diseases, harvesting, curing, seed growing, varieties of flue-cured, Burley, Green River, Maryland, and Rustica, fertilizers, manure, liming, and methods of applying fertilizers and manure.

[**Tobacco in France**] (*Mém. Manfr. État, Tabacs-Allumettes, 5 (1926), No. 4, pp. 393–493, figs. 8*).—Experiments at Beaurepaire (Isère) in 1924 (pp. 393–440) reported by P. Gisquet involved varietal comparisons, hybridization work and culture of hybrid strains, a mutation in Nijkerk tobacco, and species hybrids. Lagleyze rendered a report on the tobaccos of Greece (pp. 441–472), and J. J. T. Schloesing (pp. 473–493) gave an account of research from 1859–1864 and in the subsequent decade on factors concerned with nicotine content and burn and the permanence of foreign varieties.

The improvement of tobacco in northern Gujarat, H. H. MANN, M. L. PATEL, and V. M. MAJMUDAR (*Bombay Dept. Agr. Bul. 132 (1926), pp. 22, pls. 2*).—Progress in improvement of tobacco by selection and introduction of better types and by improved cultural and fertilizer practices is described, with notes on varietal characteristics.

Wheat germination studies with particular reference to temperature and moisture relationships, H. K. WILSON and C. F. HOTTES (*Jour. Amer. Soc. Agron., 19 (1927), No. 2, pp. 181–190, fig. 1*).—The temperature and moisture relationships of wheat (*Triticum vulgare*) were studied at the University of Illinois in material including Marquis and Illinois No. 1 spring wheat, Red Cross (Red May) and Mediterranean soft red winter wheat, and Turkey and Worlds Champion (a selection from Turkey) hard red winter wheat. Varieties from other States were also tested in a study of climatic influence on wheat germination.

A temperature of 15° C. (59° F.) was more nearly optimum for complete germination of wheat as an average than higher temperatures, although little difference was observed between 10 and 15°. Temperatures of 20 and 30° caused more rapid germination, but more nearly complete germination was had with 10 and 15°. A temperature of 30° generally rendered wheat kernels more susceptible to attack by molds and also gave more nearly optimum conditions for mold activity.

While Worlds Champion wheat germinated very poorly at 30° under ordinary conditions, increased germination with greater amounts of water at 30° suggested that the water initiated chemical and physical changes making higher germination possible. Wheats from Illinois and elsewhere germinated best at 10 and 15°, and a moisture content of 50 per cent of saturation gave good results with all varieties studied. Wheat showed a wide adaptation to varying moisture conditions. The spring and winter sorts tested showed similar general reactions to varying temperature and moisture conditions as winter wheats. The rate of initial germination of wheat at varying temperatures followed in general the principle of van't Hoff's law for chemical action. The results obtained confirmed the conclusion of Coffman (E. S. R., 53, p 223) that seed-testing laboratories should employ temperatures for wheat germination lower than those in general use.

The coleoptile bundles of Indo-Abyssinian emmer wheat (*Triticum dicoccum*, Schü bl.), J. PERCIVAL (*Ann. Bot. [London], 41 (1927), No. 161, pp.

101–105, figs. 5).—Certain wheats pertaining to *T. dicoccum* and *T. Dicoccoides* were found to possess from two to six nerves or vascular bundles in the coleoptile instead of the two characteristic of wheats and Gramineae generally. In studies with *T. dicoccum persicum*, plants raised from embryos with two coleoptile bundles were more vigorous, showed a higher tillering power, and averaged more grains per spike than those from embryos with three or four bundles. In any plant the number of grains with embryos having two, three, or four bundles, respectively, varied widely, and little or no correlation was apparent between the coleoptile bundle number of the parent and its progeny. Examination of embryos in a pedigree line suggested the character two bundles to be dominant to more than two.

Wheat in 3500 B. C., J. PERCIVAL (*Nature* [*London*], *119* (*1927*), *No. 2990*, *p. 280, fig. 1*).—The kernel characters suggested that wheat found in a vase on the site of a Sumerian house (3500 B. C.?) at Jamdet Nasr, near Kish, Mesopotamia, belongs to a variety of *Triticum turgidum*.

The baking value of French wheats [trans. title], SCHRIBAUX (*Compt. Rend. Acad. Agr. France, 13* (*1927*), *No. 5, pp. 164–173*).—Baking tests by the author, Arpin, and Pécaud (E. S. R., 49, p. 135) were made on flour from a number of varieties of wheat grown in France.

Germination experiments with seeds of different species of green manures [trans. title], J. G. J. A. MAAS (*Meded. Alg. Proefstn. Alg. Ver. Rubberplanters Oostkust Sumatra, Alg. Ser., No. 27* (*1926*), *pp. 33, pls. 2; abridged in Eng., pp. 25–33*).—Experiments involving the seed of species of Acacia, Cassia, Crotalaria, Indigofera, Tephrosia, and Vigna, and *Albizzia falcata*, *Calopogonium mucunoides*, *Centrosema pubescens*, *Leucaena glauca*, *Pueraria phaseoloides*, *Desmodium gyroides*, and *Teramnus labialis*, all green manure plants, were made to find methods of hastening germination and testing seed samples.

Treatment with water of various temperatures hastened the germination of seed of certain species, while the germination of hard seed of all species tested could be facilitated by treatment with concentrated sulfuric acid for different periods. Cutting the seed coat resulted in a good and quick germination in all species tested. Attempts to force water under pressure into the seeds were fruitless. Wide variation was observed in the hardness of seed coats, both between species and within the sample.

The dissemination of weed seeds by irrigation water in Alberta, A. HOPE (*Sci. Agr., 7* (*1927*), *No. 7, pp. 268–276*).—Weed seed catches made in irrigation ditches in southern Alberta in 1924 and 1925, by a trap similar to that used in Colorado (E. S. R., 44, p. 233), showed the seriousness of weeds in relation to irrigation. Water applied for crops gives conditions favoring weed seed germination, fall irrigations being most dangerous, since they contain newly ripened weed seed when most abundant, and the moisture remaining in the soil during the winter insures favorable germination conditions in the spring. Weed seeds from the catches possessed good viability. Contamination of irrigation water was found worse when high winds were blowing and where winds had a wide sweep. Banks of irrigation ditches arrest wind-blown seeds which eventually fall into the canals. The numbers of the principal weed seeds in the several catches are tabulated.

Notes on weeds, E. W. FENTON (*Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1927*), *No. 11*, *pp. 1014–1017*).—Comment is made on the spread or unusual behavior of the following weeds and poisonous plants prevalent in the southwestern counties of England: Mignonette or dyer's rocket (*Reseda luteola*), hoary pepperwort, perennial mercury (*Mercurialis perennis*), hemlock (*Conium maculatum*),

brooklime (*Veronica beccabunga*), broom rape, sow thistle, Canada thistle, ragwort (*Senecio jacobaea*), and bog myrtle (*Myrica gale*).

The eradication of kans (*Saccharum spontaneum* L.), A. HOWARD (*Agr. Jour. India, 22 (1927), No. 1, pp. 39, 40, pl. 1*).—Subsoiling to a depth of 8 or 9 in. is said to be effective in the control of *S. spontaneum*, a bad weed in cotton in India.

HORTICULTURE

[Horticultural investigations at the California Station] (*California Sta. Rpt. 1926, pp. 46–48, 52–57, 86, 87*).—Studies of the relation of sex to production in asparagus, cited in the preceding report (E. S. R., 55, p. 338), are again discussed. Male plants outyielded female through the production of a larger number of shoots. In the second cutting season the difference in yield exceeded 50 per cent. The effect of storage temperatures on the composition and quality of asparagus is again noted (E. S. R., 56, p. 235).

Studies in lettuce germination failed to show any acceleration from storage at low temperatures. The failure to germinate at high temperatures is believed due to an insufficient oxygen supply, as an increase in oxygen in the surrounding atmosphere or the removal of the embryo coverings resulted in increased germination. Apparently the endosperm was the active agent in preventing gas interchange. Temperatures above 20° C. (68° F.) were unfavorable to the germination of freshly harvested seed.

The turning under for 2 years of a winter legume cover crop on the entire area of the Rubidoux citrus fertilizer plats resulted in greatly improved yields on practically all of the treatments. Citrus rootstock studies conducted by H. J. Webber suggested that the degree of compatibility between stock and scion may be judged fairly accurately by the character of the union. In balanced growth no pronounced swelling takes place, and the trunk tapers gradually upward. Sweet orange, grapefruit, and rough lemon were in the order given found most promising as stocks for the lemon.

In an examination of approximately 1,800 apogamically produced citrus hybrids, H. B. Frost failed to find any new cases of clearly genetic variation aside from occasional rind chimeras in single fruits. Three more all apogamic progeny of Lisbon lemon, King mandarin, and Marsh grapefruit (seedy strain) were found to have tetraploid (n–18) chromosomes. The tetraploid forms were generally inferior in fruit quality and in general vigor and productivity, thus rendering them of doubtful horticultural value. Progress in Matthiola (stocks) breeding studies conducted by Frost and M. M. Lesley is reported.

In attempting to develop tomatoes resistant to western yellow blight, J. W. Lesley has found that certain dwarf varieties are consistent in resistance to moderate attacks. When crossed with standard varieties the dwarf character was associated with resistance in the F_2. Eight simple trisomic types of tomato were recognized in the progeny of triploid forms. Lesley and J. T. Rosa were successful in isolating improved strains of the Santa Clara Canner tomato.

Studies by I. J. Condit upon the floral character of figs showed considerable variation in the morphology of the stigmas, style, and perianth lobes. Mission flowers were characterized by simple stigmas, while those of Kadota, Adriatic, and Calimyrna were in the cleft stigma group.

Studies upon tomato fruits ripened on the vine and in ethylene gas showed comparable acid changes, but the increase in sugars was confined largely to the naturally ripened fruits.

The sex ratio in several commercial varieties of spinach was found to be approximately 1:1. Monoecious spinach plants were observed with varying proportions of male and female flowers. Self pollinations from these plants yielded monoecious progeny. Studies in onion pollination showed considerable variability in self fruitfulness. In some instances inbreeding for two generations failed to diminish vigor.

[Horticultural investigations at the Georgia Station] (*Georgia Sta. Rpt. 1926, pp. 142–149, figs. 2*).—The usual annual report (E. S. R., 55, p. 137) upon the progress of investigations.

A study of the development of the pecan nut (E. S. R., 56, p. 142) showed the development of the flower within the bud and the subsequent development of the nut to follow a definite cycle, any disturbance in which caused the nuts to drop or to fill out imperfectly. Records on nut drops showed some trees to lose from 20 to 30 nuts per day over a 10-day period in July. Contributing causes of small nuts are (1) lack of moisture in May, June, and July; (2) lack of culture during this period; and (3) poor fertilization. Causes preventing the proper filling of nuts are (1) very dry weather, (2) an extremely heavy crop, and (3) the occurrence of early frosts before the nuts are mature. Descriptions are given of the nuts produced by a number of seedling trees of known parentage.

Of several crosses within the Rubus genus, loganberry×Haymaker raspberry, Himalaya blackberry×Golden Queen raspberry, and Himalaya blackberry×Van Fleet raspberry were very successful. Van Fleet raspberry proved self-sterile. Peaches stored at 36° F. began to lose flavor in about 2 weeks and in from 4 to 5 weeks showed darkening of the flesh along the fibrovascular bundles.

[Horticultural investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1926, pp. 24–38, 40, 41, figs. 3*).—Late spring frosts, as noted for the preceding year (E. S. R., 55, p. 438), again constituted a menace to fruit crops, but fortunately most species escaped injury. Smudging in the face of a strong wind was comparatively ineffective, the average rise being only about 1.5° F.

The yields obtained in the long-continued cabbage fertilizer study again emphasized the value of barnyard manure. Plats which received 30 tons per acre in 1921 and none since yielded even better in 1926 than in either of the preceding two years. On dividing the total area into two sections, one shaded by border trees and the other in full sunlight, the computed yields per acre were, respectively, 12,430 and 24,677 lbs. A trench cutting off the roots of the trees from a part of the area materially raised the yields of the affected plats.

Observations on pecan flowers showed the catkins to appear about 10 days earlier than the female blossoms. Pollination took place about May 1, a safe date as regards spring frost. Yields obtained in 1925 upon several varieties are recorded.

The absence of winter protection did not cause injury to mature grape vines, suggesting the probability that on old vines where the cane growth is moderate the wood is quite resistant to cold. A satisfactory grape crop was produced with seven irrigations, totaling 1.92 acre-feet of water.

Lettuce germinating in September was severely injured by freezing in early November. Sowings made from November to December 15 and from January 10 to 31 generally gave good results.

Sweet peas germinating from the fifteenth to the thirtieth of October wintered satisfactorily, while earlier sowings failed. Difficulty in keeping varieties pure is ascribed to natural pollination.

The Chile Ancho did not prove as satisfactory a chili variety as variety No. 9. In a test of 27 varieties of sweet corn, those belonging to the Evergreen type were as a rule the most successful.

[Horticultural investigations at the North Carolina Station], C. D. Matthews (*North Carolina Sta. Rpt. 1926, pp. 48–52, figs. 2*).—As recorded in the report of the preceding year (E. S. R., 55, p. 235), heavy pruning of apple trees planted at the Mountain Branch Station in 1919 again materially reduced yields, leading to the suggestion that growers train their trees to the modified leader system and practice light pruning, as this combination has resulted in larger trees and earlier and greater fruiting. Comparison of northern and southern varieties of peaches in respect to hardiness in the mountainous parts of the State showed but little difference in respect to hardiness of the bud. Crosby, Engle, and Kalamazoo were particularly hardy in the trees.

Inheritance studies with rotundifolia grapes indicated that the clinging quality of the berry does not exist in this species. Size of cluster and thickness of skin are inherited, but not as unit characters and are as much or more influenced by environment. Measurements taken upon the berries of seedlings resulting from crosses between parents bearing different sized berries indicated that berry size is probably inherited. Interspecific crosses between *Vitis rotundifolia* and other species were successful in 7 of 11 instances when rotundifolia was used as pollen parent and in 3 of 11 instances, namely, *V. vinifera*, *V. cineria*, and *V. bourquiniana*, when used as ovule parent. Hybrid progeny continued to show marked sterility and low vigor, and attempts to obtain an F_2 generation were generally unsuccessful. Hybrids with bunch grapes may be considered practically sterile. In crosses between *V. rotundifolia* and various Euvitis hybrids such as Agawam, America, Beacon, Gold Coin, Muench, and Winchell, considerable success was obtained where *V. rotundifolia* was used as pollen parent and no success where used as ovule parent.

Report of the division of horticulture, W. T. Macoun et al. (*Canada Expt. Farms, Div. Hort. Rpt. 1925, pp. 51, figs. 21*).—The usual report upon experimental activities (E. S. R., 55, p. 834).

Seedling pears resulting from crosses between improved varieties such as Clapp Favorite and Flemish and hardy Russian kinds were unfortunately lacking in quality but are being used for further crossing. Attempts to develop hardy cherries by crossing improved forms with *Prunus pennsylvanica*, the pin cherry, yielded a few seeds, especially when the cultivated forms were used as ovule parents. Some seed was obtained in crosses between *P. tomentosa* and *P. pennsylvanica*. Crosses between *P. nigra* and *P. domestica* yielded six weak hybrid forms which are deemed of potential value for further breeding. Other interesting seedlings are those containing Compass, Rocky Mountain, and Zumbra cherry parentage.

In small fruits the progeny of crosses between loganberry and raspberry were sterile. Seedlings from crosses between red and purple raspberries were exceedingly vigorous and differed widely in color of fruit and habits of reproduction. A spineless gooseberry bearing good sized fruit has resulted from breeding.

Nitrate of soda increased strawberry yields, especially when part was applied in the autumn. The germination of blueberry seeds was favored by storage in moist sand at 40° F. and by preplanting treatment with a dilute sulfuric acid. The results of fruit thinning tests with Wealthy apples showed that 8-in. spacing is unnecessarily large, greater returns being secured from 4 in.

Crosses between early and late tomatoes resulted in some high quality, early bearing varieties of much promise. Favorable results were also obtained in sweet corn and pea crosses. Self-pollination by hand brushing resulted in

good sets of seed in several cabbage varieties. Breeding investigations with lilacs, iris, roses, lilies, and other ornamental plants are discussed, and descriptions are given of a large number of ornamental trees hardy in Ottawa.

Influence of salt upon growth rate of asparagus, W. RUDOLFS (*Bot. Gaz.*, *83 (1927), No. 1, pp. 94–98, figs. 2*).—As determined by data recorded in the second year, applications for two successive seasons of 150, 300, and 500 lbs. of common rock salt per acre as a supplement to 10 tons of stable and 1 ton of poultry manure exerted a regular and comparable beneficial influence throughout the growing season upon the total length and the number of stems of asparagus. The effect of the salt was not temporary but continued throughout the entire growing period.

Microsporogenesis in the cucumber, L. F. HEIMLICH (*Natl. Acad. Sci. Proc.*, *13 (1927), No. 3, pp. 113–115*).—The results of a study of microsporogenesis in a White Spine variety of cultivated cucumber are briefly discussed. The haploid number of chromosomes was found to be 7, the lowest number and the only odd number thus far reported for any of the cucurbits. Cytokinesis apparently took place by a furrowing of the plasma membrane, resulting in a quadripartition with a tetrahedral or rarely monoplanal arrangement of the microspores. A small percentage of abortion and abnormal pollen development was noted.

Methods used in breeding new fruits, R. WELLINGTON (*New York State Sta. Circ. 91 (1927), pp. 4, pls. 6*).—A brief but well illustrated discussion of methods of technique employed at the station in the development of seedling fruits, taking into consideration emasculation, pollination, protection of pollinated blooms, methods of labeling, seed stratification, and the handling of seedlings.

Pruning deciduous fruit trees in the Southwest, F. J. CRIDER (*Arizona Sta. Bul. 118 (1926), pp. 31, figs. 20*).—A discussion of the underlying principles and the practices of pruning young and mature fruit trees in Arizona.

The influence of different root stocks upon the vigour and productivity of the variety budded or grafted thereon, R. G. HATTON (*Jour. Pomol. and Hort. Sci.*, *6 (1927), No. 1, pp. 1–28, pls. 2, figs. 14*).—At the East Malling Research Station, Lane Prince Albert apple trees grafted upon 16 clonal root stocks, 9 in the Paradise group and 7 selected seedlings, varied in size from bushes to that of standard orchard trees. Measurements taken upon the total length of new wood, the size of the tree's head, number of flowering trusses formed each year, number of fruits after setting and at maturity, etc., showed remarkable differences between the trees on the several stocks. For example, during the first 7 seasons, 1919–1926, trees on stock XII made a total of 233.2±8.2 meters of growth per tree as compared with 46.9±3.6 meters for the smallest trees, stock IX. In respect to fruitfulness, trees on stock IX were the most productive and those on the vigorous stock XII the least productive. Records showed considerable differences in the average percentage of flowers to set fruit on the various stocks. No consistent relation was observed between the size of tree and fruiting capacity, trees appearing identical in size and form differing widely in productivity.

Records taken upon the individuals of the several clons showed considerable variability, which is deemed due primarily to soil differences and to variations in the biennial bearing habit. Observations upon other lots of trees of the same variety growing upon other types of soils showed the same relative differences in performance between the different stocks.

The healing of wounds in woody stems.—II, Contributions to the physiological anatomy of ringed apple shoots, T. SWARBRICK (*Jour. Pomol. and Hort. Sci.*, *6 (1927), No. 1, pp. 29–46, pls. 4*).—Along the lines reported in an earlier paper (E. S. R., 55, p. 237) the author discusses work at the Long

Ashton (*Bristol, England*) Research Station upon the healing processes in wounds formed in ringing shoots of 10-year-old apple trees.

Ringing before the middle of April, the time of bud breaking, usually resulted in the ultimate death of the growth beyond the wound. Covering the wounds with adhesive tape greatly accelerated healing processes. No callus was produced from uncovered rings before June 5, a date associated with the beginning of starch redeposition and the attainment of the full leaf stage. Ringing before the end of June resulted in double the amount of radial growth above as below the ring.

In respect to the effect of the time of ringing upon bud formation, limbs ringed before June 7 developed an unusual amount of blossom buds for the succeeding year. Ringing after the end of July inhibited flower bud formation, and the resulting vegetative buds were later in breaking than upon normal branches. Double ringing restricted the amount of radial growth from the isolated section. Knife edge rings healed so rapidly that the results were conflicting. The amount of viscous gummy substance produced in ringing wounds was relatively small and was greatest in rings made after starch redeposition commenced in the xylem parenchyma. The anatomy of the tissue developed in the vicinity of the wounds is discussed.

The propagation of fruit tree stocks by stem cuttings.—II, Trials with hard- and soft-wood cuttings, R. C. Knight and A. W. Witt (*Jour. Pomol. and Hort. Sci.*, *6* (*1927*), *No. 1*, *pp. 47–60*).—Studies at the East Malling Research Station, England, with apple, plum, and cherry hardwood and softwood cuttings taken from plants growing in various environments and plunged in sand, coconut fiber, soil, and various combinations thereof gave variable results. Poor results were obtained with apple and cherry hardwood cuttings in all instances. Much better success was obtained in greenhouse studies with softwood cuttings, apple stock XII rooting 70 per cent and cherries which failed altogether as hardwood cuttings rooting very satisfactorily. Results with the same variety varied somewhat from year to year.

In the case of Brompton and Common Mussel plums a comparison of leader tips, active laterals, and laterals with terminal buds formed showed a significant superiority for cuttings taken from the third group. Softwood apple cuttings standing for 2 or 3 days in a 10 per cent cane sugar solution rooted practically like the controls and much better than those immersed in water alone. Softwood plum cuttings etiolated by burial in soil prior to separation from the mother plant rooted far better than controls, suggesting to the authors that physiological rather than nutritional causes affected the results. Observations upon softwood cuttings taken from a single plant at different times in the growing season showed better rooting with the early cuttings. Of the various rooting media tested, sand gave the best results.

***Experiments upon the removal of lateral growths on young apple trees in summer*: The effect on stem and root development**, R. G. Hatton and J. Amos (*Jour. Pomol. and Hort. Sci.*, *6* (*1927*), *No. 1*, *pp. 61–71*).—Records taken at the East Malling Research Station upon normal nursery apple trees and those with the lateral growths along the lower trunk removed showed definitely that this treatment affects the tree adversely, both in weight and in growth. Contrary to expectations, even the height growth of the leader was in one instance reduced. The size and the weight of the roots were also reduced by pruning.

The relation in the apple between the development of young shoots and the thickening of older stems, R. C. Knight (*Jour. Pomol. and Hort. Sci.*, *6* (*1927*), *No. 1*, *pp. 72–77*, *pls. 2*).—A histological study at the East Malling Re-

search Station of a large number of young apple shoots gathered at different stages of growth showed that at the time of bud breaking the new xylem appeared first in the region of the developing buds and spread vertically downward. By the time that thickening had begun in the portion of the stem bearing no secondary shoots, the upper sections had shown several layers of new xylem. The author suggests that the initiation of growth in the vicinity of buds is likely due to the fact that carbohydrates are more readily available at these points. The significance of the results to certain pruning practices, such as the removal of lateral shoots from young trees, is discussed.

Determination of hardiness in apple varieties and the relation of some factors to cold resistance, A. C. HILDRETH (*Minnesota Sta. Tech. Bul. 42 (1926), pp. 37, figs. 5*).—Comparing injury records taken upon the terminal growth of apples exposed to low temperature produced by artificial refrigeration with the known behavior in the orchard there was found a close correlation between the results of the freezing tests and of field experience. Despite minor fluctuations varieties of known hardiness were invariably in the hardy group and tender kinds in the tender group. Observations on twigs held at —30° C. (—22° F.) for 3- and 12-hour periods showed increased injury in every instance of longer exposure, indicating that the degree of cold injury is directly proportional to the duration of the exposure. Rapid thawing and rapid freezing caused increased injury as compared with gradual changes. That desiccation is not a potent factor in increasing winter injury was indicated in lots of excised apple twigs, which, despite outdoor exposure during 2.5 cold months and an abnormal water loss, opened their buds in a normal manner when brought into the greenhouse.

Studies undertaken to determine the relation between hardiness and chemical composition failed to show that moisture, sugar, pentosans, or amino nitrogen contents offered any reliable basis for separating hardy and tender varieties. Hardy varieties were, however, apparently better supplied with carbohydrates and total organic nitrogen, suggesting that the ability to resist cold rests on the ability to accumulate reserve materials and hence is on a nutritional basis.

Arsenical spray residue and its removal from apples, F. D. HEALD, J. R. NELLER, F. L. OVERLEY, and H. J. DANA (*Washington Col. Sta. Bul. 213 (1927), pp. 56, figs. 19*).—In studies of various methods of removing spray residues and of the effect of each upon the keeping quality of the fruit, dry wiping was not found as effective as liquid cleaning. Dry wiping was proportionately less effective in the case of a slight than in a considerable excess of poisons. In the former case some of the spray was apparently rubbed into the waxy covering of the fruit. Spreaders did not and oil sprays did materially affect the efficiency of dry cleaning. Unless followed by the application of protective materials dry cleaning increased the percentage of decay, the loss in weight, and attendant shriveling.

Of various solvents tested for cleaning apples, hydrochloric acid, 1 to 2 per cent, proved most effective. Soaking for 10 minutes in 1 per cent hydrochloric acid followed by rinsing in water was effective but slow and expensive. A more rapid treatment in which moving apples were sprayed under force with dilute acid and rinsed with water gave promise of being much more rapid and economical. Preliminary observations of stored fruits showed no increase in decay following the spray treatment. The machinery for cleaning apples is still in the experimental stage.

Apple spray program for West Virginia, L. M. PEAIRS and E. C. SHERWOOD (*West Virginia Sta. Circ. 46 Sup. (1927), pp. 4, fig. 1*).—This spray program for apples is offered as a supplement to Circular 36 (E. S. R., 51, p. 240).

Some factors influencing the rooting of vine cuttings, A. J. Winkler (*Hilgardia [California Sta.], 2 (1927), No. 8, pp. 329–349, figs. 11*).—Records upon the rooting of Sultanina grape cuttings divided into three groups according to the degree of staining of fresh cut ends following immersion for one minute in a 0.2 per cent solution of iodine in potassium iodide showed 62.5 per cent of rooting in those cuttings which showed deep staining throughout the wood and very dark staining in the medullary rays, 35.3 per cent in those which showed only slight staining in the wood and deep staining in the rays, and 16.9 per cent in those which showed no staining near the cortex, faint staining near the pith, and well defined staining in the rays.

Determinations of starch in the three groups gave figures in accord with the iodine test, indicating that the latter is sufficiently accurate from a practical standpoint. Reducing substances were about equal in all three groups.

Time of planting studies showed the value of earliness, the best results being secured with December planting. Records taken on the Alicante Bouschet variety showed that the December planted cuttings developed more and longer roots.

Attempts to stimulate rooting by immersion in solutions of various chemicals were successful, especially in the case of oxidizing agents, among which manganese sulfate was the most effective. Oxidizing agents hastened callus and root formation, stimulated rooting in difficult varieties, and also had a stimulating effect on the growth of the resulting plant during the first season in the nursery. Reagents showing oxygen in their formulas seemed to be capable of a certain amount of oxygenation of the tissues in addition to oxidation in its strict sense.

American stocks: Investigation of grafted vines, S. W. van Niekerk and C. J. Theron (*Union So. Africa Dept. Agr. Bul. 10 (1927), pp. 11*).—Herein are briefly set forth notes upon the vigor, soil preferences, and resistance to phylloxera and other pests of numerous American grape stocks which are under test in South Africa.

The Concord grape: Pruning and chemical studies in relation to the fruiting habits of the vine, A. L. Schrader (*Maryland Sta. Bul. 286 (1926), pp. 61–118, figs. 17*).—As previously recorded (E. S. R., 51, p. 538), under good cultural conditions it was found possible to develop a complete framework for young Concord grape vines by the close of the second season in the vineyard, thus bringing them into production at an earlier age than usually recommended. The most favorable results were obtained where the main trunk was carried to the top wire at the end of the first season. Severe pruning at the close of the first season decreased the growth of the root system the following year. In respect to the relation of cane length to production, medium-length canes were most productive under the four-cane Kniffin system with each cane pruned to 12 buds. The differences in yield were due largely to the number of bunches per bud, moderate growth being apparently correlated with a greater differentiation of flower primordia. In respect to location on the cane, basal buds were found least fruitful under all conditions and the middle buds most fruitful under average conditions. In strongly vegetative canes the region of maximum production apparently shifted away from the base.

Studies of the seasonal changes in the composition of Concord vines again discussed (E. S. R., 54, p. 444) failed to show any appreciable transfer of carbohydrates from the top to the roots or vice versa during the dormant season. A marked hydrolysis of starch occurs during midwinter in the tops of young vines and in the canes of bearing vines with a reverse toward spring, but the total carbohydrates showed no change except trivial loss due to respiration. In

1-year-old vines about 75 per cent of the total carbohydrates and 80 per cent of the total nitrogen were found in the roots after November 1. The roots of young vines apparently absorb large amounts of nitrogen following the abscission of the leaves.

Analyses of the nodes on the developing shoots during the growing season showed an apparent correlation in the middle of June between the chemical composition and the subsequent fruiting of the node; for example, starch, nitrogen, and sugar were relatively low in the three basal buds and high in the fourth and fifth, the most fruitful nodes. The sixth, seventh, eighth, and ninth nodes were relatively high in sugars and nitrogen and medium in starch.

Propagation of date palms from offshoots, D. W. Albert (*Arizona Sta. Bul. 119 (1926), pp. 33–56, figs. 19*).—Detailed information is given on the methods employed in the separation of offshoots from parent date palms and upon the subsequent care of the young plants. The superior value of large size was shown in a considerably lower mortality in the case of large offshoots. Those planted in an open nursery showed better survival than did those set under a lattice screen. Offshoots in which rooting was stimulated by mounding prior to separation from the parent palm survived better than did unrooted shoots. In respect to the time of separation, the period from April 15 to July 1 proved most satisfactory.

Growth rates of Valencia oranges, D. D. Waynick (*Calif. Citrogr., 12 (1927), No. 5, pp. 150, 164, figs. 4*).—Measurements taken at 30-day intervals throughout the growing season upon Valencia oranges showed the maximum growth to occur during the period of September 1 to December 1. On the average, Valencia oranges grew three times as much in this period as they did in the succeeding January, February, and March. No fruit which was below average size on December 1 attained an above average size at the time of picking. Observations up to September 1 upon the new and old crops showed a well-defined correlation in size. In general, the inside fruits on the tree made a proportionately greater growth after December 1 than did the outside fruits. In respect to soil influence fruits of trees on sandy soil attained full size earlier than did those of trees on heavier types.

As a practical deduction, the author points out that trees should have ample food and moisture during the critical period of September 1 to December 1.

Effect of fertilizers and cover crops on growth of pecan trees and the influence of soil conditions on resistance to winter injury, J. J. Skinner and C. A. Reed (*Ga.-Fla. Pecan Growers Assoc. Proc., 1925, pp. 20–33, figs. 4*).—Experiments conducted by the U. S. Department of Agriculture with pecans growing near Oglethorpe, Ga., showed very definitely that fertilizers, especially those containing considerable nitrogen, were highly beneficial to growth. A severe cold wave in January, 1924, interfered with fruiting and prevented accumulating data on yield. Ground rock phosphate and ground limestone used alone or in combination had no appreciable beneficial effect upon growth. No significant differences were noted between various cover crops, provided that equally good stands were obtained. The combination of bur clover and lespedeza for some unknown reason gave poor results. Observations following the cold wave indicated that the character of the soil, especially the drainage and subsoil, had more influence on the reaction of trees to the freeze than did fertilizers or cultural treatments. There was slightly more winter injury in trees receiving high nitrogen fertilizers than in those receiving a high proportion of phosphoric acid and potassium. Trees located on soils deficient in natural drainage suffered most severely.

Results of fertilizer experiments with pecans in the Jacksonville section, [illegible]

pp. 24–32).—In experiments carried on cooperatively by the U. S. Department of Agriculture and the Florida Experiment Station upon two soil types, Bladen fine sandy loam and Norfolk fine sand, applications of fertilizers induced a more vigorous tree growth and increased the yield of pecans. Nitrogen and potassium were more effective than phosphorus, and it was quite evident that potassium was much more important on these light sandy soils than on heavier soils in southern Georgia.

The gladiolus and its culture, A. C. Beal (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner & Co., 1927, pp. 124, pls. 11, figs. 5*).—General information is given upon the propagation, culture, and forcing.

The iris, J. C. Wister (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trubner & Co., 1927, pp. 122, pls. 11, figs. 14*).—This book contains popular information upon species and varieties, culture, propagation, etc.

Rosa odorata as a grafting stock for indoor roses, F. F. Weinard and H. B. Dorner (*Illinois Sta. Bul. 290 (1927), pp. 455–463, fig. 1*).—A comparative test of *R. odorata* and *R. manetti* as stocks for greenhouse roses showed no significant differences between the two in the case of the Columbia variety. Over a 3-year period the total yields were approximately equal, and no differences of any practical importance were noted in respect to stem length. The result of a single year's test with other commercial roses agreed in general with the results obtained with Columbia. However, in the instance of Souvenir de Claudius Pernet the plants on odorata stock grew better and flowered more freely than those on manetti.

The cultivation of shrubs, K. M.-P. Cloud (*New York: Dodd, Mead & Co., 1927, pp. IX+305, pls. 16*).—A general treatise.

Book of landscape gardening, F. A. Waugh (*New York: Orange Judd Pub. Co., 1926, [3. ed.], pp. XIII+236, figs. 65*).—This, the third edition, contains useful information upon plant materials, their arrangement, and adaptation to landscape work.

The house beautiful gardening manual, F. Steele (*Boston: Atlantic Mo. Co., 1926, pp. VII+152, pl. 1, figs. 215*).—A comprehensive guide to the arrangement, planting, and care of gardens.

FORESTRY

Forestry [at the California Station] (*California Sta. Rpt. 1926, pp. 69–71*).—Studies in seed production and distribution indicated that with the aid of meteorological records the amount of seed and the distance to which seed may be distributed may be predicted with considerable accuracy over a period of years. Arranged according to the order of efficiency in disseminating seed are Sitka spruce, western yellow pine, white and Douglas firs, grand fir, incense cedar, sugar pine, and redwood.

Studies of the effect of burning upon range flora showed that a single burn may conspicuously increase the amount of brush cover through opportunity for invasion by new species. Animals and birds served as carriers of seed of brush species. Grazing by goats and sheep following a single burn resulted in the destruction of a large proportion of the brush.

Studies in tolerance of New England forest trees.—VI, A portable instrument for measuring solar radiation in forests, G. R. Burns (*Vermont Sta. Bul. 261 (1927), pp. 30, figs. 12*).—This continues the series previously noted (E. S. R., 56, p. 443). Herein is discussed the construction and the operation of a portable instrument designed to measure solar radiation, and by the use of color filters to determine intensities of the different wave lengths of light. The time required for making readings was found to vary from about one

minute in full sunlight to several in changing lights. Data obtained in experimental tests with the instrument in the laboratory and in the field are presented in detail.

Trees of Honduras, S. J. Record (*Yale Univ. School Forestry, Trop. Woods, No. 10 (1927), pp. 10–47*).—Brief descriptive notes are given for a large number of species of Honduran woods.

A descriptive catalogue of some of the common trees and woody plants of Kenya Colony, E. Battiscombe (*London: Crown Agents for Colonies, 1926, pp. [5]+142, figs. 42*).—With nomenclature based on determinations made at the Royal Botanic Gardens, Kew, brief descriptions are given of various plants.

Progress report of forest research work in India for the year 1925–26 (*Forest Research Inst., Dehra Dun, Prog. Rpt., 1925–26, pp. [2]+143, pls. 3*).—A general progress report containing brief comments upon various activities, silviculture, botany, entomology, chemistry, etc. The administration report of the Forest Research Institute at Dehra Dun is included.

DISEASES OF PLANTS

[Plant pathology at the California Station] (*California Sta. Rpt. 1926, pp. 66, 76, 77, 78, 79*).—The pathological work here summarized includes notes on fig soft rot; attempts to find strawberry varieties resistant to strawberry yellows (which has again given evidence that it belongs to the so-called virus type, transmitted mainly by aphids); work on the Verticillium wilt of tomatoes (which proves to be much more abundant than previously had been realized, the organism causing also a serious black heart disease of many fruit trees); and investigation of Armillaria or oak root fungus (with particular reference to resistant varieties).

Sulfur recovered in refining illuminating gas was used by E. R. deOng in a large series of spore tests in closed-ring cells at pH 4.8 on the Monilia form of brown rot and on the fungus *Botrytis cinerea*. It completely inhibited germination of the former fungus, and in case of the latter an average germination of only 5 to 10 per cent occurred when 0.1 per cent concentration of the hydrocarbon-sulfur compound was used. Preparations of 0.6 per cent of commercial flowers of sulfur or ground sulfur were not so efficient. The hydrocarbon-sulfur compound was found to oxidize about 28 per cent more rapidly than the flowers of sulfur.

In studies on pear blight continued by Day (E. S. R., 56, p. 453), tests were made on the penetration of the bark of the cankers by various chemicals with a view to killing the bacteria without injury to the cambium. One method used is to scarify the cankers and then apply a water or glycerine solution of mercuric chloride and mercuric cyanide. A fruit-tree crown gall treatment not involving surgery is also being tried.

W. P. Duruz has shown by confirmatory experimentation that Bordeaux mixture, applied at blooming time and again after the calyx is shed, apparently protects against the shot hole fungus of apricot.

Plant pathology [at the Citrus Experiment Station] (*California Sta. Rpt. 1926, pp. 57–59*).—Studies of citrus fruit rots and bark diseases (E. S. R., 54, p. 351; 55, pp. 844, 747), continued during the year by Fawcett, included new types of citrus fruit decay.

Tests with applications, as made annually during three years, indicate that by maintaining a coat of certain disinfectants on the trunks of orange trees psorosis (scaly bark) may be largely prevented. The scraping method has been found to be very effective if properly carried out.

Further studies on the crown rot of walnut, by J. T. Barrett and C. O. Smith, substantiate former findings (E. S. R., 55, p. 344) as to the relatively high susceptibility of the southern black walnut (*Juglans californica*), the comparative resistance of the northern black walnut (*J. hindsii*), and the high degree of resistance of the English walnut (*J. regia*). *Phytophthora* sp. has again been isolated from lesions which have advanced into the English walnut bark. This fungus seems to be more virulent on English walnut bark than the Pythiacystis form when artificial inoculations are made.

In control tests against mildly attacking cantaloupe powdery mildew (*Erysiphe cichoracearum*), by Barrett and P. A. Miller at El Centro, Imperial Valley, sulfur (of all brands and grades, both as dust and in solution) in all cases, under the high temperatures at the time, proved toxic to the plants. No conclusions could be reached as to control.

Inoculations made by L. J. Klotz testing for the cause or causes of the resistance of certain citrus species to gummosis (*Pythiacystis citrophthora*) indicate thus far that the resistance or susceptibility of sour orange and lemon to this fungus is strictly relative. Differences, however, exist in the susceptibility of the trunk tissue sufficient to justify use of this species for the study of a possible chemical basis of immunity. The inhibitory factor appears to be water soluble and thermostable, the effect decreasing with dilution. Seedlings of lemon and of sour orange showed no differences as regards injury caused by extracellular toxic substances produced by Pythiacystis in pure culture. Similar study is planned of the tomato varieties Norton (resistant) and Stone (susceptible) in connection with *Fusarium lycopersici*. In tests made as to the effect of the toxic substances produced by the fungus, Norton showed (as judged by outward appearance) a lower susceptibility than did Stone.

In tests by Smith as to the protective influence of germicides on nursery trees of the Diospyros lotus against crown gall infection practically all appeared negative, as both treated and untreated trees planted in infected soil developed crown gall. Prunus species and varieties were tested for crown gall resistance, and these showed resistance decreasing in the order *P. pumila*, *P. mume*, *P. umbellata*, *P. angustifolia*, and *P. mexicana*.

[Plant disease investigations at the Georgia Station] (*Georgia Sta. Rpt. 1926, pp. 140, 141*).—During the year 242 peach seed from a badly rosetted tree were planted, and the 71 seedlings obtained made vigorous growth during the summer, showing no definite symptoms of rosette.

Most of the Georgia crop plants are said to be susceptible to the soil-inhabiting fungus, *Sclerotium rolfsii*, this fact making it difficult to plan a rotation method that would control the organism by starvation. Sweet potatoes are effectively protected by heavy applications of hydrated lime to the bedding soil. The amount of lime necessary varied with the soil type. Even the heaviest doses tried, 8 tons per acre, appeared to stimulate sprouting of the sweet potatoes. This method of control is expensive, and is, therefore, not applicable to most field crops. Several fungicidal dusts applied about the base of pepper plants did not afford protection against *S. rolfsii*.

[Plant disease studies at the New Mexico Station] (*New Mexico Sta. Rpt. 1926, pp. 17, 18*).—Late results from the chili wilt experiment (E. S. R., 55, p. 444) show no definite correlation between soil moisture content and wilt prevalence. Possibly this is due to the small number of chili plants in the experiment or to a variation in soil texture. The plat irrigated at 16-day intervals gave the lowest percentage of wilted plants and the highest yield of chili per plant. The average moisture content of the various plats appeared to be about the same regardless of the lengths of intervals between irrigations.

Attempts to isolate an organism from measled apple wood again gave negative results, though a wide variety of culture media was used. Healthy Jonathan scions grafted on measled trees remained healthy.

Texas root rot appears to be spreading, and a number of young cotton plants were killed by sore shin, the weather having been favorable for the disease in the spring of 1926. A species of Fusarium was isolated from dying cotton plants. The trouble appears to be widespread in the Rio Grande Valley.

Plant pathology, S. G. Lehman (*North Carolina Sta. Rpt. 1926, pp. 58–63*).—Four papers reporting work on soy bean diseases, by Wolf and Lehman, have been noted (E. S. R., 55, pp. 752, 753). Soy bean Cercospora disease, brought under observation during the previous summer, is thought to be identical with the disease said to be described by Miura from south Manchuria, in 1918, as caused by *C. daizu*. This disease is being studied as to whether it is carried by the seed. As part of the work on disease control by seed disinfection, formaldehyde was tried, and this was found to reduce germination materially at all concentrations. Semesan and Uspulun solutions and Bayer and Semesan dusts increased germination. The use of organic mercury disinfectants appears to be profitable, due to the favorable influence on germinability, regardless of their control of seed-borne diseases.

Ground limestone, this year as previously (E. S. R., 55, p. 243), failed to control *Sclerotium rolfsii* on soy beans. The same was true of solutions of formaldehyde, mercuric chloride, and an organic mercury compound poured on top of the row.

Control of seed-borne cotton anthracnose by the use of dry heat on a large scale, as attempted by the use of a large tobacco-curing barn, seems to be impracticable with the present structure and equipment, the most serious difficulty being that of maintaining the necessary temperature of 95° C. (203° F.) during the last stages of the experiment. Double-wall construction and increased circulation might remedy the present defects. The cost at present for kerosene is 30 cts. per bushel of seed. Steam under pressure, as also used in the dry-heat treatment for anthrocnose, in connection with forced circulation, is described as to its advantages, disadvantages, and (higher) costs.

Acid delinting tests for control of anthracnose and bacterial boll rot (*Bacterium malvacearum*), as described with results from various concentrations, show that, although with 66° B. acid delinting is usually complete in 10 to 15 minutes, seed can be left in such acid 20 to 24 hours, and, in fact, germination was sometimes increased in such cases.

Studies on wheat take-all, in cooperation with the Office of Cereal Investigations, U. S. D. A., showed very slight incidence of the disease even in varieties which had proved very susceptible during the previous two years. This fact suggests the question as to whether or not the disease is permanently reduced in virulence.

Studies on wheat rust are detailed as looking to control through the establishment of varieties markedly resistant (particularly to leaf rust) and at the same time climatically adapted. The season was unfavorable to conclusive results.

Mycological investigations (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), p. 66*).—Investigations during 1924 dealt with a runner bean root bacterial disease and a wilt disease of cyclamen. Mosaic disease investigations are still in progress. Other diseases not previously made known through the station are reported.

Plant pathology in France [trans. title], R. Bordeau (*Sci. Agr., 6 (1926), No. 11, pp. 396–402*).—Brief accounts are given of the organization of phyto-

pathology in France, outstanding plant diseases, and prominent French contributions to phytopathology.

Pathological plant anatomy, E. KÜSTER (*Pathologische Pflanzenanatomie. Jena: Gustav Fischer, 1925, 3. ed., rev., pp. XII+558, figs. 285*).—In this edition alterations and additions have increased considerably the size of the book over the second (E. S. R., 36, p. 46), some sections having been wholly rewritten. Review of recent literature was attempted as far as November, 1924.

Cell sap reaction and immunity studies [trans. title], G. TORSTENSSON (*Ztschr. Pflanzenzücht., 10 (1925), No. 2, pp. 167–172*).—Employing the terms as used by Michaelis (E. S. R., 48, p. 412), the author holds that it is primarily not the titration or actual acidity, but the potential acidity, that concerns the investigator of immunity to disease.

Measuring water flow interference in diseased stems, I. E. MELHUS, J. H. MUNCIE, and W. T. H. HO (*Phytopathology, 15 (1925), No. 1, p. 44*).—The authors report devising an apparatus for measuring the rate of flow in diseased and normal plant stem tissues. By the use of this apparatus it is possible to measure the flow interference caused by *Bacterium tumefaciens*, *Fusarium conglutinans*, and other parasites.

Studies on Rhizoctonia, K. S. THOMAS (*Onderzoekingen over Rhizoctonia. Proefschr., Rijks-Univ., Utrecht, 1925, pp. [5]+98, pls. 10*).—This work deals with the systematic relationships among parasitic and other members of the genus Rhizoctonia, and includes studies on the relationships of fungi which have been assigned to other genera. About 100 references to related literature are given.

Viscum v. Loranthus: A case of double parasitism, N. K. TIWARY (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 187*).—A brief account is given of a specimen collected in Nepal which shows a plant of Loranthus parasitic on a specimen of Viscum, the latter being parasitic in its turn on a separate host.

Geographical distribution of the milkweed flagellate, Herpetomonas elmassiani Migone: Its non-pathogenicity in Maryland, F. O. HOLMES (*Phytopathology, 15 (1925), No. 1, p. 46*).—The occurrence of flagellates in the latex of the milkweed, *Asclepias syriaca*, was traced from Maryland to northern New Jersey. In Maryland heavily infected and uninfected plants growing side by side were said to have been indistinguishable in height, color, and number of seed pods produced. It is believed that the plants are capable of supplying abundant food to the flagellates without limiting their own growth.

The variety as a unit in studies of disease resistance, L. J. STADLER (*Phytopathology, 15 (1925), No. 1, p. 51*).—In a study of percentages of infection of a considerable number of stocks of Fulcaster wheat and Kherson oats, the author found differences in the percentage of infection between stocks of the same variety. It is claimed that the results of a disease resistance test may be properly applied only to the strains actually tested.

Inheritance of disease resistance in wheat and oats, E. F. GAINES (*Phytopathology, 15 (1925), No. 1, p. 51*).—In testing more than 500 varieties and selections of wheat in response to resistance to bunt, the author found variations from immunity to complete susceptibility. Crossing varieties and testing the progeny in subsequent generations showed that resistant wheats may carry different factors for resistance which are cumulative in effect. From a test of 208 varieties of oats for resistance to covered smut, 23 were found to be immune. Resistance in wheat is believed to be recessive but dominant in oats, and both may be interpreted best on the basis of multiple factors.

[Diseases of California cereal crops] (*California Sta. Rpt. 1926, pp. 40, 41*).—Studies by Allen, as previously noted (E. S. R., 55, pp. 146, 652), have been

completed, and a preliminary study of wheat stripe rust (*Puccinia glumarum*) has been started. Barley rusty blotch causes a shriveling of the kernels. It is said to be caused by a Helminthosporium hitherto undescribed. Crossings between Chevalier (immune) and Abyssinian (very susceptible) gave immune F_1 plants. In the F_2 the ratio of attack (3:1) indicates simple Mendelian inheritance due to a single-factor difference.

In further investigations of resistance to bunt (*Tilletia tritici*), by Briggs (E. S. R., 55, p. 129), a highly resistant and a moderately resistant strain of Galgalos wheat produced about 5 and 25 per cent, respectively, of the disease.

Of eight new chemical dusts tested, two which have mercury as the toxic basis controlled bunt as efficiently as did copper carbonate, six being unsatisfactory. Mice fed wheat treated with copper carbonate lived for two weeks without any apparent ill effects, but they would not eat the treated wheat if untreated was available.

Satisfactory infection with covered smut of barley (*Ustilago hordei*) was obtained with artificially inoculated seed of barley. To save the labor of skinning the seed by hand, and thus make large scale work practical, experiments were conducted which indicate that the barley hull, lemma, and palet may be removed rapidly with acid. In every case the percentage of infection with acid-skinned seed was at least as high as with the hand-skinned seed.

The Dilophospora disease of cereals, D. Atanasoff (*Phytopathology, 15 (1925), No. 1, pp. 11–40, figs. 9*).—A description is given of a disease of wheat, rye, spelt, and various grasses caused by *D. alopecuri*. The disease is said to occur only on plants attacked by *Tylenchus tritici*, and the relation between the two organisms is discussed at length.

For the control of the disease, prevention of nematode infection is of prime importance, and the sowing of clean seed, field sanitation, and crop rotation are recommended.

The control of loose smuts of wheat and barley, and barley stripe by Uspulun, Semesan, and Germisan, H. A. Rodenhiser and E. C. Stakman (*Phytopathology, 15 (1925), No. 1, p. 51*).—Uspulun, Semesan, and Germisan controlled loose smuts of wheat and barley, and barley stripe when the seed was soaked at 45° C. (113° F.) for one hour or longer. Germisan also practically eliminated stripe when the seed was soaked for three hours at ordinary temperatures. Shorter periods of immersion were not effective. Hot Germisan injured the seed slightly.

Susceptibility of wheat varieties to smut [trans. title], A. Milan (*Staz. Sper. Agr. Ital., 57 (1924), No. 10–12, pp. 400–404*).—Tests of wheat varieties for smut susceptibility are tabulated.

Soft rot of the Arum, W. F. Bewley (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), pp. 74, 75*).—A disease of Arum, previously reported and briefly described (E. S. R., 47, p. 542; 50, p. 547), has been subjected to further tests as to control methods. One hour for the formaldehyde corm dip usually proves to be sufficient to destroy the organism, *Bacillus aroideae*.

A bacterial disease of the roots of runner beans, R. W. Butcher (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), pp. 66–69*).—Runner bean plantlets a few weeks old are described as showing a wilt which is said to be associated with a yellow and a white bacillus, the latter alone giving positive results from inoculation. It is regarded as a strain of *Bacillus carotovorus*. Bean plants inoculated at 85° F. showed little injury, but at 64° serious infection resulted, especially in connection with wet soil.

Drop of Chinese cabbage and common cabbage, W. H. Davis (*Phytopathology, 15 (1925), No. 1, p. 50*).—The author reports having observed on various varieties of cabbage fungi morphologically identical with *Sclerotinia sclero-*

tiorum, which causes lettuce drop. A species of Botrytis was isolated from and grew abundantly on dead portions of Chinese cabbage, but it was not associated with the life cycle of Sclerotinia. Inoculations within the host species and reciprocal inoculations of cabbage, Chinese cabbage, and lettuce gave positive results.

Second progress report of black rot (Pseudomonas campestris) investigations on Long Island: Seed infection and seasonal development, E. E. Clayton (*Phytopathology, 15 (1925), No. 1, pp. 48, 49*).—In greenhouse experiments cauliflower seed plants, spray inoculated, developed pod lesions in 7 days, while the incubation period for succulent young plants was from 13 to 15 days. Inoculations of seed pods of cabbage and Brussels sprouts were also successful. The organism is said to have remained alive for 3 years in naturally infected seed. With cauliflower the major portion of secondary infection took place directly through the uninjured lower leaf surface. Such infections occurred commonly on Brussels sprouts and occasionally on cabbage.

Stringent protection against all insects did not check the spread of the disease, rain and plant contacts incident to cultivation being the principal agencies of dissemination.

Second progress report on seed treatment for black leg (Phoma lingam) and black rot (Pseudomonas campestris) of cruciferous crops, E. E. Clayton (*Phytopathology, 15 (1925), No. 1, p. 49*).—Hot water treatments of from 14 to 30 minutes at 50° C. (122° F.) gave good, but not complete, control of blackleg and, with one exception, complete control of black rot. Seed treatments with organic mercury compounds, corrosive sublimate, etc., gave unsatisfactory control. In experiments with one lot of seed infected with black rot, Germisan and mercury cyanide gave complete control, but the latter greatly reduced germination. Dupont No. 13 (an organic compound of mercury) gave excellent control of blackleg but was completely ineffective against black rot.

Dusting celery seedbeds to control blights, A. G. Newhall (*Phytopathology, 15 (1925), No. 1, p. 50*).—Both bacterial blight and late blight were greatly reduced by dusting the seedlings from two to four times with 20–80 copper-lime dust at about weekly intervals before transplanting to the field.

Leaf-spot of maize, a disease distinct from leaf-blight, C. Drechsler (*Phytopathology, 15 (1925), No. 1, p. 47*).—A report is given of a leaf spot of maize due to a species of Helminthosporium distinct from *H. turcicum*. The disease was characterized by longitudinally elongated buff lesions on maize leaves from Florida and the Philippines that were typically much smaller and more numerous than those of leaf blight. Under experimental conditions the fungus proved to be violently pathogenic to maize but caused only incipient lesions on rice and sugar cane.

Relation of internal cob-discoloration to yield in corn, R. A. Jehle, F. W. Oldenburg, and C. E. Temple (*Phytopathology, 15 (1925), No. 1, p. 52*).—Seed corn from ears which showed red, gray, and other abnormal internal cob discoloration was compared with lots practically free from cob discoloration. The yield records show an apparent correlation between internal cob discoloration and yield, which was more highly pronounced on light sandy and clayey soils than on the best corn land.

The control of flax rust, A. W. Henry and E. C. Stakman (*Phytopathology, 15 (1925), No. 1, p. 53*).—The authors report several varieties of flax immune or highly resistant to flax rust (*Melampsora lini*). Some strains of Argentine flax were found immune to rust, and also wilt resistant, while rust resistance and wilt resistance are not considered necessarily correlated. Rust resistance appears to be dominant, and segregation in the F_2 indicates that immunity can be combined with the desired morphological characters.

Conditions of attack and development of Helminthosporium allii on garlic [trans. title], G. CAMPANILE (*Staz. Sper. Agr. Ital.*, *57* (*1924*), *No. 10–12*, *pp. 413–429, figs. 4*).—Outlining conditions of development of *H. allii* on garlic, the author states that immersion of the bulbs in a 3 per cent solution of commercial (40 per cent) formalin for a few minutes gives adequate protection.

Lettuce tipburn investigations, C. D. MATTHEWS (*North Carolina Sta. Rpt. 1926, pp. 54–57, figs. 2*).—A brief account of the lettuce tipburn survey and other investigations showed the amount of tipburn to be in direct proportion to the number of headed plants. The irrigated plants headed earliest and burned worst. In shaded plats every one of the few plants that headed showed tipburn. There may prove to be some relation between tipburn and insect spotting. Burning is as severe in shade as in direct sunlight. No cultural practices diminished tipburn, but irrigation seemed to increase the trouble. Investigations are in progress to determine the cause of tipburn and to develop a resistant strain of Big Boston lettuce.

The blossom-end rot of pepper, B. B. HIGGINS (*Phytopathology*, *15* (*1925*), *No. 1, pp. 50, 51*).—In a previous publication (E. S. R., 49, p. 346) a description is given of a disease of pepper which was ascribed to physiological causes, principally variations in moisture supply. Subsequent investigations have repeatedly shown that it is possible to produce the disease experimentally by manipulation of the water supply. The lesions develop near the blossom end of young, rapidly growing pepper fruits when transpiration is high and soil moisture not sufficient to supply the needs of the plant. Spots are produced by a collapse of large cells about the ends of the small veinlets which are abundant near the blossom end of the fruits.

The "pollu" disease of pepper, Y. RAMACHANDRA RAO (*Jour. Madras Agr. Students' Union*, *14* (*1926*), *No. 1, pp. 5–10*).—Pollu (empty or imperfect berry), an important cause of loss to pepper growers in north Malabar, is associated with one or more of several causes, including a flea beetle, a gallfly, and a fungus (*Colletotrichum necator*), the last named probably conditioning in the main the enormous amount of spike fall that occurs during years of heavy precipitation.

Bordeaux mixture at 0.5 to 2 per cent, with various adhesives, greatly diminished the pollu disease and spike fall, repelled the flea beetle, and gave larger berries.

The "pollu" disease of pepper, Y. RAMACHANDRA RAO (*Indian Sci. Cong. Proc.* [*Calcutta*], *12* (*1925*), *p. 35*).—Subsequent to the work noted above it was found that in plants treated with Bordeaux mixture mealybugs increased enormously and greatly weakened such plants. This is believed to have been due to the fungicidal action of Bordeaux mixture, whereby some entomogenous fungus which had been keeping mealybugs under control may have been eliminated. The same condition is said to have appeared in the experiences in other countries, and this phase of the matter is to be further investigated.

Effect of intermittent temperatures on potato mosaic, C. M. TOMPKINS (*Phytopathology*, *15* (*1925*), *No. 1, p. 46*).—Experiments in constant air control chambers are said to indicate that relatively short exposures to high temperatures are sufficient to mask mosaic completely. Mosaic plants placed for 9 hours at temperatures above 24° C. (75.2° F.) but remaining at temperatures favorable for mosaic for 15 hours recovered in 7 days. At temperatures above 24° new leaves produced are not mottled or crinkled and lack all the symptoms characteristic of mosaic. In plants where mosaic was masked by high temperature, the characteristic symptoms were again induced by exposing the plants to favorable low temperatures.

Bordeaux or Burgundy mixture as a preventive to potato disease (Phytophthora), J. N. CHAKRAVARTY, S. K. MITRA, and L. L. READE ([*Assam*] *Dept. Agr. Bul. 1* (*1925*), *pp. 5*).—In the Khasi and Jaintia hills the potato ranks next to rice in importance, being practically the only money crop, and in the plains, where with sugar cane it forms a very important money crop, its cultivation is extending rapidly. Generally, two crops are grown each year, one being planted in February or March and harvested in July or August, the other (summer) crop being planted both in garden and in jhum (fresh) land. The former of these crops is more susceptible to "pang iong" or blight (*P. infestans*), which has been present since 1886, causing more considerable damage in moist than in drier weather.

Experimentation has established the efficacy of Bordeaux mixture 10–10–100 or of Burgundy mixture 10–12.5–100. Aside from the protection given by spraying, lowering of deterioration or losses may be effected by hand selection, by renewal of seed (but only from colder to warmer places), and by the use of seed collected from jhum lands and of winter seed exclusively for summer crops.

A study of potato seed treatment for Rhizoctonia control, H. G. MACMILLAN and A. CHRISTENSEN (*Wyoming Sta. Bul. 152* (*1927*), *pp. 55–67, fig. 1*).—Experimentation was carried on during 1921–1925 on *Rhizoctonia solani*, said to constitute the most common fungus disease of potato in Wyoming. The object was to determine the need and value of seed treatment, the only measure considered efficacious. The tests were applied to seed potatoes of Bliss Triumph and King (as representatively early and late varieties grown extensively in Wyoming).

A study of the tables indicates the presence of other factors besides Rhizoctonia. The results in 1923 were greatly impaired by early blight (*Alternaria solani*). No consistent benefit from irrigation was apparent.

It appears that the mercuric chloride seed treatment (1:1,000), as here used, is effective, consistently increasing yields in both the early and the late maturing variety to a paying extent. Early as compared with late irrigation has no controlling effect on the severity of Rhizoctonia disease. A slighter infection of the seed potatoes, whether treated or untreated, lessens the severity of the disease.

Wart disease (*Scot. Jour. Agr.*, *7* (*1924*), *No. 1*, *pp. 72–82*, *fig. 1*).—It is stated that although of all countries in the world Britain is the one in which potato wart disease is most general in its distribution, there is still risk of further spread of the disease in that country by foreign potatoes. The present account deals with the history, distribution, and control of potato wart.

Control measures consist essentially in the avoidance of infection by controlling transportation and in the use of immune varieties, of which lists are furnished. Importation regulations are outlined as maintained by or as operative against several countries which are named.

Witches' broom of potatoes, H. R. MCLARTY (*Sci. Agr.*, *6* (*1926*), *No. 11*, *pp. 394, 395, figs. 3*).—A disease known as witches' broom is reported from British Columbia, where damage has been caused in commercial plantings. The distinguishing characteristics are extreme dwarfing and yellowing of the plants grown from diseased tubers, the great masses of fine, much branched stems, and the production of an almost innumerable number of small tubers which are usually found to be sprouting and sending up new stems. Additional characteristics, which might cause this trouble to be confused with other diseases, are (in newly affected plants) a rolling of the leaves quite similar to that of leaf roll and the presence of aerial tubers quite similar to those caused by Rhizoctonia

Though but little is known as to the spread of the disease, it is thought that spread occurs slowly from plant to plant in the field and that with careful roguing and selection the disease should not be severely injurious.

Suggestions on the method of producing seed potatoes, J. BUSHNELL and P. E. TILFORD (*Ohio Sta. Bimo. Bul., 12 (1927), No. 2, pp. 41–44, fig. 1*).—The present problem faced by seed producers is largely that of leaf-roll control. Roguing has not proved adequate to keep certified seed potatoes satisfactorily free from leaf roll in northern Ohio. It is necessary also to secure a foundation stock free from leaf roll and related virus diseases and to take special precautions to prevent infection from neighboring fields.

A leaf-spot of redtop caused by an apparently undescribed species of Helminthosporium, C. DRECHSLER (*Phytopathology, 15 (1925), No. 1, pp. 51, 52*).—The author reports having found in the vicinity of Washington, D. C., the foliage of redtop that was spotted with elongated regions of a dull reddish-gray color. A form of Helminthosporium was obtained from the central portions of the affected regions which differs from the parasite causing purple leaf spot of oats. It is also said to differ from *H. siccans* in the inferior dimensions of the conidia and in pathological habit.

Investigations on the sugar cane disease situation in 1925 and 1926, C. W. EDGERTON and E. C. TIMS (*Louisiana Stas. Bul. 197 (1927), pp. 50, figs. 11*).—The developments of the last two years, which have demonstrated the soundness of the general conclusions presented in the bulletin previously noted (E. S. R., 52, p. 548), are here presented and discussed.

Louisiana sugar crops continued to be very unsatisfactory, particularly in 1926, because of unfavorable weather, cultivation, drainage, cane borer attack, and cane diseases. Cultural and drainage practices rendered the cane more susceptible to root rot attack. The major cane diseases, red rot, mosaic, and root rot, seriously affected yield. Root rot factors considered include the presence of toxic substances in the soil, the improper ratio of the mineral elements in the soil, the pitting of the roots by soil animals, the activities of nematodes, and the relation of parasitic fungi. Cane root fungi, partly saprophytic, include also facultatively or actively parasitic species of Marasmius, Rhizoctonia, and Pythium. The Java disease pokkn bong has recently developed in Louisiana. Excellent results as regards mosaic and root rot protection have been obtained by seed selection. Results from seed and soil treatment have not always been consistent. Good cultural practices have resulted in good cane yields.

Studies on the cytology of sugar cane mosaic, M. T. COOK (*Phytopathology, 15 (1925), No. 1, p. 45*).—The author claims that the white areas of infected leaves are thinner than the green areas or than normal leaves. Intercellular plasmodial bodies are frequently observed in the white areas, and the nuclei are more conspicuous than in the green areas of normal leaves. Plasmodial bodies are found in all tissues of the stem except the outer ones. They are always most conspicuous in actively growing parts, but they are not easily found in the older parts of leaves or stems or in old cankered canes. The photosynthetic activity of mosaic canes is greatly reduced.

Selecting for resistance to the sugar cane mosaic, C. W. EDGERTON (*Phytopathology, 15 (1925), No. 1, pp. 45, 46*).—As a result of selection experiments continued for a number of years, the author reports having obtained strains of sugar cane of high resistance to the disease.

Mottle-necrosis of sweet potatoes, L. L. HARTER (*Phytopathology, 15 (1925), No. 1, p. 45*).—In a previous publication (E. S. R., 54, p. 49) attention was called to a field disease of the enlarged roots of sweet potatoes called mottle-necrosis. A further study of this disease has enabled the author to isolate a

species of Pythium from the dead tissue. From the almost constant association of the fungus with the disease, as well as the results of some preliminary inoculations in the laboratory, it is believed that Pythium is the causal organism.

The relation of soil moisture to the pox disease of sweet potatoes, R. F. POOLE (*Phytopathology, 15 (1925), No. 1, p. 48*).—Feed and edible roots of the Vineless Yellow Jersey variety of sweet potatoes were severely infected by *Cystospora batatae* when grown in infected soil maintained at 4 and 6 per cent moisture. At 8 and 10 per cent moisture the edible roots were not attacked, but the feed roots showed a large number of spots. At 12, 14, and 16 per cent the infection was very slight, while the maximum productions of both raw potatoes and total dry weights were obtained. At 18 per cent (soil saturation) there was no infection.

Sweet potato varieties that produce well and are resistant to stem rot on sassafras sands, R. F. POOLE (*Phytopathology, 15 (1925), No. 1, p. 48*).—The author reports three varieties of sweet potatoes that are resistant to stem rot disease due to *Fusarium batatatis* and *F. hyperoxysporium*, and that yielded well on most of the infected soils where the native Jersey varieties were grown at a loss due to heavy destruction by the disease.

A virus from potato transmissible to tobacco, J. JOHNSON (*Phytopathology, 15 (1925), No. 1, pp. 46, 47*).—Symptoms of disease were obtained on tobacco plants inoculated with an extract from mosaic potato foliage that are said to have been distinctly different from tobacco mosaic and generally characterized by a faint mottling or irregular necrotic areas. A combination of potato mosaic and tobacco mosaic virus on tobacco produced another symptom, different from either one used alone. Similar results were secured with tomatoes. The causal agent of both the single and the combination symptoms on tobacco can be transmitted repeatedly from tobacco to tobacco.

The author believes that either potatoes free from this virus are rare, or else extract from healthy potato foliage may cause a physiological disturbance of tobacco and tomato plants which is of an infectious nature.

Soil treatment with various disinfectants.—Preliminary report, T. G. MAJOR (*Sci. Agr., 6 (1926), No. 8, pp. 283–285*).—Comparative tests, made in 1925, with a number of tobacco seed bed soil disinfectants, showed that while the dust treatments control the black root rot disease (*Thielavia basicola*) they injured the germination and stand and reduced the size of the plants. The formaldehyde preparations apparently did not injure the host plants as much as did the organic mercury compounds. None of the preparations checked the development of weeds without also injuring the tobacco.

The significance of the 1924 outbreak of western yellow tomato blight in the United States, M. SHAPOVALOV (*Phytopathology, 15 (1925), No. 1, p. 50*).—The author reports that in the summer of 1924 nearly 100 per cent of the tomato crop in one locality in California was destroyed by this disease, and also about 30 per cent of the total commercial crop in the State of Utah. This unusual outbreak of disease was considered due to a combination of climatic factors which tended to produce a high rate of evaporation.

A bacterial rot of the tomato stem, R. W. BUTCHER (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), pp. 73, 74*).—A tomato stem rot showed in pure culture as its probable cause *Bacillus carotovorus*, a common cause of soft rot in vegetables.

Cytological studies of crowngall tissue, A. J. RIKER (*Phytopathology, 15 (1925), No. 1, p. 48*).—Comparisons of cells which developed in tomato plants after infection by crown gall bacteria, and after wounds, have shown a close similarity between the cells in crown gall and wound tissue.

The influence of temperature and of previous infection on the development of crowngall, A. J. RIKER (*Phytopathology, 15 (1925), No. 1, p. 45*).—Crown galls were secured on the aerial parts of tomatoes grown at temperatures of from 14 to 28° C. At from 28 to 30° only poorly developed galls were produced, and above 30° none appeared. The host plants made fairly good growth at these temperatures. At from 8 to 10° inoculated plants made practically no growth and produced no galls in a month. The growth relation of the causal organism in media showed that vegetative development was active over the range of temperature approximating that where galls were secured. A search for agglutinins or precipitins in plants which bore large galls, or in the galls themselves, gave negative results. However, after the crown gall organism had been injected into a rabbit a serum was produced which possessed agglutinating properties in dilutions of 1:3,000.

The timing of apple scab sprays, H. C. YOUNG and C. MAY (*Ohio Sta. Bul. 403 (1927), pp. 28, figs. 12*).—The principal aim in the present study was to determine procedures enabling growers to save material and labor, reduce spray injury, and control scab effectively. In the main the problem hinged around timeliness in spraying.

The life cycle of the apple scab fungus (*Venturia inaequalis*) is summarized. Ascospore expulsion conditions and data are presented for different points in the State, and a method of procedure is given for the prediction of periods of ascospore discharge and infection. Sprays were most effective when applied just previous to the periods of predicted infection.

The stage of development of the tree proved to be no indicator as to the proper time to apply scab sprays, which are found to be effective over a comparatively short period only.

Dusting and spraying for disease control in Pennsylvania, 1922, R. C. WALTON (*Crop Protect. Digest, 1 (1924), No. 4, pp. 19–28*).—Spraying and dusting were conducted in five orchards, employing commercial lime sulfur both with and without Kayso, Pyrox, 90–10 dust, 85–15 dust, and copper dust. The data are chiefly tabulated, the results being given in detail for each of the five areas.

Cause and prevention of peach canker, R. C. WALTON (*Penn. State Hort. Assoc. Proc., 67 (1926), pp. 40–45*).—In the previous work, noted above, spray injury appeared to have caused peach canker. The 1925 work, planned to find how to avoid loss from this cause, employed a number of fungicidal applications, the effects of which are severally detailed and tabulated. Lead arsenate was shown to be a cause of injury in several cases. Sulfur decreased lead injury as, perhaps, lime did also.

Three little known diseases of peach, W. A. MCCUBBIN (*Penn. State Hort. Assoc. Proc., 67 (1926), pp. 46–50*).—Rootlet rot, punky rot, and heart rot are briefly discussed.

Verticillium wilt of the red raspberry, G. H. BERKELEY and A. B. JACKSON (*Sci. Agr., 6 (1926), No. 8, pp. 261–270, figs. 9*).—Since 1923 a disease of raspberries first known as blue stem but later called wilt, and caused by a Verticillium, has been reported as affecting the varieties Cuthbert, St. Regis, Marlboro, Viking, and Herbert in Ontario. A description is given of the associated organism, which is supposed to be a new species and has been named *V. ovatum*.

Suggestions offered, based on the resemblance of this fungus to the one causing the wilt of potato, eggplant, tomato, pepper, and (in the Netherlands) cherry, include the use of healthy, certified stock, crop rotation, and avoidance of interplanting crops known to be susceptible.

Etiology and transmission of endosepsis (internal rot) of the fruit of the fig, P. D. Caldis (*Hilgardia [California Sta.], 2 (1927), No. 7, pp. 287–328, pls. 16, figs. 3*).—The fig fruit spoilage disease here dealt with has been briefly reported previously (E. S. R., 54, p. 453). This disease of Calimyrna and other caprified figs, said to be here for the first time described (with discussion of its synonymy and economic importance) as a result of work done since the spring of 1923 is designated by the preferred name endosepsis or internal rot. It is said to be caused by *Fusarium moniliforme fici* n. var., which permeates the tissues and causes the disease when used to inoculate, being readily reisolated. Strain 93 is considered the type form of the new variety, which may prove to be synonymous with *Oospora verticillioides*. The organisms are described, their physiological and cultural reactions are given, and their taxonomic relations are discussed. They are carried mechanically by the caprifying insect, *Blastophaga psenes* L., and the figs are sterile until entered by this insect. The life history of the pathogen is outlined.

Cacao canker in Java, C. Hartley (*Phytopathology, 15 (1925), No. 1, p. 44*).—Cacao canker, a red rot of the outer bark, is said to be caused by *Phytophthora faberi*. In most countries Phytophthora infections are said to be more numerous in the pods than in the bark, but in Java the cankers are reported to be more numerous than the rotten pods. The author considers that promiscuous cutting out of the lesions does more harm than good in Java.

Observations on bark diseases of citrus trees in Sicily, H. S. Fawcett (*Phytopathology, 15 (1925), No. 1, pp. 41, 42*).—The author reports having observed in Sicily the following diseases of citrus: Pythiacystis gummosis, decorticosis (shellbark), citrus blast and black pit on lemons, and psorosis on orange trees.

Dusting with monohydrated copper sulphate and lime for control of pecan scab, J. B. Demaree and J. R. Cole (*U. S. Dept. Agr., Dept. Circ. 412 (1927), pp. 8*).—Owing to difficulties in the use of the liquid sprays, recommended in the publication previously noted (E. S. R., 55, p. 551), trials were made with dusts in 1926 at Thomasville and near Albany, Ga.

A mixture of monohydrated copper sulfate and lime dust analyzing approximately 7 per cent metallic copper is said to have controlled the common scab effectively in these two localities during the summer of 1926. In addition to orchard sanitation, four to six applications of a 20–80 mixture of monohydrated copper sulfate and lime dust are tentatively recommended. The dust should be applied while the leaves are wet with dew or rain.

Cyclamen wilt disease, R. W. Butcher (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 10 (1924), pp. 69–72*).—A cyclamen wilt disease which has done much damage in nurseries during several years was associated with an organism closely related to *Bacillus vulgatus* and *B. mesentericus*, but the probable primary cause is thought to be *Heterodera radicicola*.

Control of damping-off in coniferous seed beds, C. May and H. C. Young (*Ohio Sta. Bimo. Bul., 12 (1927), No. 2, pp. 45–47*).—Damping-off in seed beds, an important factor in conifer seedling production, may be augmented by a later seedling blight. Both of these are described as due mainly to the same fungi, chiefly *Corticium vagum* (*Rhizoctonia* sp.) and *Pythium debaryanum*, which overwinter in soil. To destroy these fungi, both greenhouse and field experiments were carried out on red pine (*Pinus resinosa*) with a view to determining the best method of application and the relative value of sulfuric acid, sulform, formaldehyde, several organic mercuric compounds, and other materials.

The results, as tabulated, show the formaldehyde treatment to be superior, and a 3 per cent solution is recommended for most soils. Organic mercury was

unsatisfactory. Kalimat, Abavit, Wa Wa dust, and colloidal copper hydroxide failed to control the disease. Sodium silicofluoride and sodium acid fluoride injured germination, and, of the plants that appeared, 37 per cent showed damping-off. Sulfuric acid impaired germinability.

Some observations on root diseases of Hevea brasiliensis, A. Sharples (*Malayan Agr. Jour., 12 (1924), No. 12, pp. 404–407*).—Critical comments on conclusions contained in contributions indicated are supplemented by an account of the author's own studies isolating four fungi from diseased roots of *H. brasiliensis*, camphor, and *Aleurites montana*, and dealing with the characters and classifications.

A preliminary note on a new bark disease of Hevea, A. Thompson (*Malayan Agr. Jour., 12 (1924), No. 6–7, pp. 163, 164*).—During the last quarter of 1923 a Hevea disease of renewing bark which had previously been observed again became active, now doing evident damage as in the majority of cases the fungus penetrated to the wood and caused a bark rot. The symptoms are described. The fungus appears to have been educated up to the level of parasitism in a comparatively short time.

The disease appears amenable to treatment when affected trees are put out of tapping and painted twice, seven days apart, with a 10–15 per cent solution of Agrisol or Brunolinum plantarium. Sterilization of tapping knives also appears necessary.

Field experiments relating to brown bast disease of Hevea brasiliensis, A. Sharples and J. Lambourne (*Malayan Agr. Jour., 12 (1924), No. 9–10, pp. 290–343, pls. 3*).—Evidence from prolonged tapping experiments indicates a physiological origin for Hevea brown bast. Supposedly, excessive extraction of latex is the most important factor in the production of this disease. No definite correlations have been established with such other possible factors as rainfall, etc.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The new natural history, J. A. Thomson (*New York and London: G. P. Putnam's Sons, 1926, vols. 1, pp. [8]+384, pls. 16, figs. 480; 2, pp. [7]+385–768+[3], pls. 16, figs. 409; 3, pp. [8]+769–1152+[3]+XIV, pls. 15, figs. 428*).—A popular account of the various classes of animals.

The summer birds of central New York marshes, A. A. Saunders (*Roosevelt Wild Life Bul. [Syracuse Univ.], 3 (1926), No. 3, pp. 329–497, pls. 15, figs. 65*).—The first part of this account, dealing with the values of marshlands and their wild life, is followed by a description of the marshes studied, the life of the marshes other than birds, method of studying the marsh birds, notes on the birds observed, and a list of references.

Wisconsin birds, F. S. Van Vuren (*Milwaukee Jour. Pub. Serv. Bur., 1926, pp. 78, figs. 41*).—An illustrated pocket reference book to Wisconsin birds.

The hawks of New Jersey and their relation to agriculture, L. A. Hausman (*New Jersey Stas. Bul. 439 (1927), pp. 48, figs. 36*).—A practical account, including descriptions of 12 hawks, the vulture, and the bald eagle, their economic importance, nesting habits, and identification; a migration chart; a table showing the classification of the New Jersey hawks; and tabular comparison of the food elements of these hawks. Tables are also given of (1) notes, residence, and physical characters of hawks, and (2) the nesting of hawks. Keys for the separation of hawks (1) at hand and (2) in the field are included.

Pheasant farming, G. M. Simpson (*Eugene, Oreg.: Shelton-Turnbull-Fuller Co., 1927, pp. 96, pl. 1, figs. 43*).—This is a practical account.

Utilization of food by young oysters, G. W. Martin (*New Jersey Stas. Bul. 442 (1927), pp. 12, figs. 7*).—This further report on investigations of oysters (E. S. R., 57, p. 57) deals with the utilization of food. Young oysters, under controlled laboratory conditions, were fed pure cultures of microorganisms, including four kinds of diatoms and an alga, as well as scraped Zostera, their rate of growth being compared with that of starved oysters and of oysters growing under extremely favorable natural conditions as to food. Of 69 oysters fed with single food organisms (including Zostera) all but one made measurable growth in average shell diameter in 3 weeks. The average increase was more than two and one-half times that of starved oysters kept under similar conditions during the same period, but less than one-sixth that of oysters suspended in open water containing rich plankton. There were no significant differences between the average increases made by oysters fed diatoms, green algae, or Zostera. The great variation in growth between individuals growing under exactly similar conditions suggests the possibility and the desirability of securing for propagation rapidly growing strains of oysters.

Some principles of oyster dredging, J. R. Nelson (*New Jersey Stas. Bul. 443 (1927), pp. 21, figs. 24*).—The author discusses methods of gathering oysters, correct methods of oyster dredging, dredging in relation to depth of water, and size of equipment.

Location of the entomological collections of the world [trans. title], W. Horn (*Sup. Ent. [Deut. Ent. Mus.] No. 12 (1926), pp. 133, pl. 1*).—A contribution to the history of entomo-museology. This work consists mainly of a statement of the location of entomological collections, arranged by collectors in alphabetical order.

[Report of work in entomology and parasitology at the California Station] (*California Sta. Rpt. 1926, pp. 64–66, 67*).—In referring to work with apple insects by A. D. Borden it is stated that the so-called skin worm, *Argyrotaemia (Tortrix) franciscana* (Wlshm.), was observed on both the Gravenstein and late apples, in one orchard infesting over 15 per cent of the entire crop. In experimental orchards in Sonoma County two definite periods were observed in which uniformly good control of the rosy apple aphid might be obtained. Observations were also made of the second brood of codling moth larvae.

Investigations of the common red spider (*Tetranychus telarius* L.), by J. F. Lamiman, indicate that highly refined lubricating oil emulsions are very effective against all stages of the mite where the spray is thoroughly applied as soon as the infestation begins.

Further investigations by E. O. Essig of the mealy plum aphid (E. S. R., 55, p. 351) indicate that the winter is passed in the egg stage on the fruit trees, there being no evidences that the late fall adults hibernate on cat-tails and reed grasses. The use of soap sprays consisting of 4 to 8 lbs. of soap to 100 gal. of water proved effective, the weaker solution giving as good control as the stronger.

In work by E. R. deOng and J. Tyler with xanthates as a control agent, nematode eggs and larvae were killed in vitro by carbon disulfide fumes from acidified xanthate. Tests made in the greenhouse were successful when infested soil and fresh cut galls were treated with xanthate in closed cylinders. Nematode larvae were killed in pots treated by large amounts of paradichlorobenzene.

In control work by [F. H.] Wymore with the striped and twelve-spotted cucumber beetles various arsenical dusts and fluosilicate were equally satisfactory. A spray with pyridine extract was the most satisfactory treatment for the corn ear worm.

Investigations by H. H. Severin of the origin of the beet leafhopper in the Santa Clara Valley indicate that it is from the mountain ranges in the southern part of the valley. Greenhouse work has shown a considerable number of additional plants to be susceptible to curly top, a list of which is given.

Reference is made to observations by W. B. Herms of the Hippelates fly which has become a serious pest in the Coachella Valley and is believed to be responsible for the spread of pink eye among children (E. S. R., 56, p. 251).

[Report of work in entomology at the California Citrus Experiment Station] (*California Sta. Rpt. 1926, pp. 49–52*).—In work conducted by H. J. Quayle the fumigation of citrus with cyanide seemed to show less leakage of gas through the tent where calcium cyanide was used than when the source of gas was from the liquid hydrocyanic acid.

A comparative study made of *Aphis gossypii* and *A. spiraecola* on citrus has shown the presence of a number of characteristics that are consistently different. This has led to the conclusion that two separate species are represented, both of which are widely distributed over the citrus area.

A study of the different species of Dictyospermum scale has shown that the species which occurs on Kentia palms in Los Angeles County is the same as that found on citrus in the Mediterranean countries and on the avocado in Florida.

An account is given of the progress of beneficial insect investigations conducted under the direction of H. S. Smith. The parasite *Comperiella bifasciata* of Chrysomphalus was the principal introduction during the year from the Orient. This parasite of red scale was propagated in considerable numbers and colonized in various orchards and parks. The results indicate that the common red scale (*Chrysomphalus aurantii*) is resistant to it, but since it breeds freely on *C. ficus* it may prove of value in localities where that scale is an important pest, namely, Florida, Egypt, and South Africa.

A dipterous predator, introduced from Palestine, where it is a valuable enemy of mealybugs, is under study particularly as relates to its interference with the production of Cryptolaemus in the insectary.

The internal parasite of the black scale from South Africa, *Coccophagus modestus*, continues to maintain itself in the open at Riverside and perhaps other places, but its ultimate economic value remains to be determined.

Brief reference is made to the progress of studies of the orange tortrix conducted by A. J. Basinger. Native parasites continued to hold the moths in check over most of the range.

[Report of entomological work at the Georgia Station] (*Georgia Sta. Rpt. 1926, pp. 123–125*).—The injury to cotton due to an attack of the cotton flea was so severe that hardly more than the top crop was gathered. The total gain from dusting cotton with sulfur for the control of this pest amounted to 223 lbs. of seed cotton per acre, nearly all of which was from the first two pickings. The boll weevil was scarce in the vicinity of Experiment, where punctured squares were first observed in September. The total emergence of the boll weevil in open and protected cages in 3 localities was as follows: At Experiment 0.02 per cent of 8,373 weevils caged, at Tifton 0.98 per cent of 4,000 weevils caged, and at Statesboro 2.20 per cent of the 1,000 weevils caged. A much larger percentage of emergence took place in protected than in open cages.

Montana insect pests for 1925 and 1926, R. A. Cooley (*Montana Sta. Bul. 200 (1927), pp. 26, figs. 2*).—In the first part of this report the author discusses the more important entomological features of the two years, including

the occurrence of the Mormon cricket (*Anabrus simplex* Hald.) in western Montana, mosquitoes, and the sugar beet leafhopper (*Eutettix tenella* Baker). Under the heading of Insect Pests of 1925 and 1926 W. B. Mabee lists the pests reported, by hosts and crops, giving localities and dates of occurrence.

A list of the insects injurious to agricultural and horticultural plants in Hokkaido [trans. title], S. Kuwayama (*Hokkaido Agr. Expt. Sta. Bul. 42 (1926), pp. 12+130*).—In this contribution from the Hokkaido Experiment Station at Kotoni, Sapporo, the author records some 226 pests of importance.

List of publications on Indian entomology, 1925 (*Agr. Research Inst., Pusa, Bul. 165 (1926), pp. 62+X*).—This list, arranged alphabetically by authors, records new genera and species.

Insects attacking vegetable crops in Connecticut in 1925, W. E. Britton (*Conn. Veg. Growers' Assoc. Rpt. 1925, pp. 13–19*).—Brief accounts are given of the more important insect enemies of truck crops in Connecticut.

The needs of medical entomology, L. O. Howard (*Amer. Nat., 61 (1927), No. 673, pp. 173–179*).—A symposium contribution given in Philadelphia in December, 1926.

Tar distillate wash trials in the Bristol Province, A. H. Lees and L. N. Staniland (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt., 1925, pp. 77–82*).—The results of experimental work with 4 and 8 per cent strengths of tar distillate washes are reported in tabular form, and followed by a discussion.

Spraying and dusting experiments with potatoes on Long Island in 1926, H. C. Huckett (*New York State Sta. Circ. 90 (1927), pp. 10, pls. 2*).—This is a report of work conducted at Riverhead, Farmingdale, and Greenport, L. I., for the control of insect pests on potatoes, including aphids, leafhoppers, and flea beetles.

In work with leafhoppers the use of two nozzles to the row and applications averaging 75 gal. of insecticide per acre did not prevent the eventual destruction of the foliage by them at an early date. It is thought that in combating leafhoppers the effectiveness of the spray application is improved by attaching a board to the spray platform in early July so that it brushes over the vines ahead of the spray. The second brood of flea beetles occurring during the last week of July caused much greater injury to foliage than the first brood, which appeared during June. Extra early arsenical applications of spray and dust were made for the first brood of flea beetles, and spray mixtures were effective in reducing the degree of feeding injury. Considering the amount of injury caused by both insects it is concluded that spraying gave much better protection to the foliage than dusting. This result is thought to be due largely to the frequency with which dust was washed off the foliage by rain shortly after application rather than to the relative insecticidal value of the spray and dust materials.

A preliminary study of petroleum oil as an insecticide for citrus trees, E. R. deOng, H. Knight, and J. C. Chamberlin (*Hilgardia [California Sta.], 2 (1927), No. 9, pp. 351–384, figs. 4*).—This is a progress report on the special investigations commenced in 1914 but later discontinued because of lack of facilities until 1924 when a cooperative project was undertaken by the station and the Standard Oil Company of California.

It is pointed out that petroleum oils of the kerosene and "stove distillate" type (28 to 32° A. P. I.) have been occasionally used as insecticides over a period of many years in citrus orchards with varying results as to insecticidal effects and injury to the trees and fruits. The nonviscous oils of a low boiling point, such as kerosenes, are safer to use on the trees than those of high boiling points, but are unsatisfactory as scalecides because of relatively low toxicity

combined with high volatility. Highly refined, white lubricating oils are probably the most advisable for use on citrus trees, especially at summer temperatures. Oils of low viscosity are apparently safer to use on trees than those of high viscosity, due to the more rapid disappearance of the former. Severe injury to the citrus trees from the use of lubricating oil is associated with the presence of a high percentage of unsaturated hydrocarbons.

Refining petroleum oil with sulfuric acid removes the injurious constituents aromatics, olefines, resins, and sulfur. The filtration of petroleum oils through fuller's earth has not shown itself effective in reducing the amount of injurious constituents present. Gross symptoms of injury to citrus trees from the use of unrefined petroleum oils include defoliation, fruit spotting and dropping, and the killing of twigs and branches. In addition to these injuries, there is an apparent interference with the normal plant functions of transpiration and respiration.

A quick-breaking emulsion utilizes to the maximum degree the insecticidal agent. Two per cent nonvolatile lubricating oil with 98 per cent of water as a carrier has, when applied as a quick-breaking emulsion in the laboratory, produced a complete kill of red scale on lemons. Stable oil emulsions using the same ingredients are ineffective against this scale at strengths of from 4 to 8 per cent of actual oil. The quick-breaking action in an emulsion is greatest when the average size of the dispersed oil globules is greatest, and that size is greatest when the proportion of emulsifier to oil is least. The concentration of oil in the run-off from sprays containing 2 per cent concentration of oil varied from 2.5 per cent for the stable type of emulsion to 0.39 per cent for the quick-breaking type in laboratory tests on glass plates.

The insecticidal action of unrefined lubricating oils seems to be the result of two principal lethal factors. These are suffocation and toxic action, or poisoning. The former results chiefly from nonvolatility (film permanence), the latter chiefly from the action of unsaturated hydrocarbons in the case of unrefined petroleum oils, or that of free fatty acids in the case of vegetable oils. The wax solubility of oils is one of the important factors determining the insecticidal effectiveness of lubricating oils against the red scale. In the quick-breaking emulsions the free oil dissolves the waxy scale covering and enables the oil to penetrate to the spiracles; stable emulsions, with which the liberation of free oil does not readily occur, lack this feature to a great extent and are therefore not so effective.

The lethal immersion period varies from a few seconds for the most toxic substances tested to 16 days for the least toxic. Volatility limits of the oil range from a few minutes or hours to several weeks. Various physiological disturbances, which are highly characteristic and little understood, are induced in citrus trees by the use of neutral white oils in quick-breaking emulsions. These disturbances are evidenced by special types of leaf and fruit drop, but not by actual burning or spotting (except possibly in rare instances). Free fatty acids, while highly effective as insecticides for aphids, are not suitable for use in quick-breaking emulsions at the high concentration required for the control of scale insects, because of the injurious effects on plant tissue of such concentrations of the acids.

Collembola injuring leaves of mangold seedlings, W. M. Davies (*Bul. Ent. Research, 17 (1926), No. 2, pp. 159–162, pls. 2*).—An account of injury by *Bourletiella hortensis* Fitch (*pruinosus* Tullb.) observed at the Rothamsted Experimental Station.

The bean leaf hopper, Z. P. Metcalf (*North Carolina Sta. Rpt. 1926, pp. 68, 69*).—A brief reference is made to work with this pest, an account of ex-

tended studies of which by Beyer in Florida has been noted (E. S. R., 47, p. 758). It is of economic importance in North Carolina to cotton, soy beans, peanuts, Irish potatoes, garden beans, cowpeas, and to a long list of flowers and ornamental plants. Its damage to cotton is done chiefly while the plants are small through producing a peculiar stunting. Observations indicate that plants severely attacked do not entirely recover and continue to make a poor growth with very few fruiting branches. On the flowering plants it produces characteristic pale spots and stunting of the plant, together with a failure to develop flower clusters.

In control work a satisfactory relief was obtained by using calcium cyanide diluted with two parts of sulfur.

Notes on the froghopper blight of sugar-cane in Trinidad, E. P. Mumford (*Bul. Ent. Research, 17 (1926), No. 2, pp. 139–150*).—An account of injury by *Tomaspis saccharina*, which is one of the two main causes of blight of sugar can in Trinidad, the other being attacks of root fungi, Marasmius and Odontia.

Certain grass hosts of the sugar cane mosaic disease and of the corn aphid considered in relation to their occurrence in Cuba, M. N. Walker and C. F. Stahl (*Trop. Plant Research Found. [Wash., D. C.] Bul. 5 (1926), pp. 14*).—Many grasses, both wild and cultivated, which serve as host plants for the corn leaf aphid and also hosts of the sugar cane mosaic disease, are constantly found in and near the sugar cane fields in Cuba. Of the cultivated grasses sorghum is considered to be the greatest menace to sugar cane. Grama pintada (*Echinochloa colonum*) and pata de gallina (*Syntherisma sanguinalis*) are two of the most important wild grasses yet found in Cuba from the standpoint of field transmission of the mosaic disease.

[The citrus aphid and its control] (*Fla. State Hort. Soc. Proc., 39 (1926), pp. 156–171*).—Several papers are presented relating to *Aphis spiraecola*, including New Facts About the Citrus Aphid and Its Natural Enemies, by F. R. Cole (pp. 156–158); Another Year's Experience with the Citrus Aphis, by J. R. Watson (pp. 159–164); Snuff as an Insecticide, by R. L. Miller (pp. 165–168); and Factors Affecting the Control of the Green Citrus Aphid with Nicotine Dust, by W. W. Yothers and O. C. McBride (pp. 169–171).

Second note on the Coccidae of Palestine, F. S. Bodenheimer (*Bul. Ent. Research, 17 (1926), No. 2, pp. 189–192, figs. 4*).—These data, which supplement the account previously noted (E. S. R., 53, p. 157), include 14 species not previously recorded, 2 of which are new to science.

Lubricating oil emulsion for the control of San Jose scale, D. Isely (*Ark. Agr. Col. Ext. Circ. 164, rev. (1926), pp. 2*).—A revision of the circular previously noted (E. S. R., 51, p. 552).

Studies of Lecanium corni Bouché [trans. title], C. Blattný and S. Novický (*[Czechoslovakia] Min. Zemědĕl., Sborn. Výzkumn. Úst. Zemědĕl. No. 17 (1926), pp. 94, pls. 4, figs. 19; Ger., Fr. abs., pp. 92–94*).—This is a report of studies of the European fruit Lecanium, an outbreak of which in Czechoslovakia from 1920 to 1925 resulted in the destruction of numerous prune trees.

Investigations of the best races of the silkworm for introduction into Egypt, W. M. Charobim (*Recherche des Meilleures Races de Vers à Soie (Bombyx mori) à Introduire en Egypte. Thesis, Univ. Toulouse; Paris: Occitania, E. H. Guitard, 1926, pp. 202, figs. 31*).—The chapters of part 1 (pp. 9–89) of this work deal with the history of the silkworm, the silk industry in Egypt, rearing technique, influence of climatic conditions, and flacherie and pebrine. Part 2 (pp. 91–191) presents an account of the work in 1924 and 1925 of the zoology and entomology laboratory of the University of Toulouse, crossings in 1925, temperature and hygrometric observations in Egypt, and a

discussion of the results obtained in crossing experiments. A bibliography of 5 pages is included.

On the etiology and epidemiology of the gattine disease of the silkworm [trans. title], A. PAILLOT (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 3, pp. 251–253*).—It has been found by the author that the silkworm disease known in France as gattine, and in Italy as macilenza, is caused by the *Streptococcus bombycis* of Flügge.

Some observations on the Malaysian coconut zygaenid (Artona catoxantha Hamps.), B. A. R. GATER (*Malayan Agr. Jour., 13, 1925), No. 4, pp. 92–115, fig. 1*).—This is an account of the biology and control of an important pest of the coconut in Malaya and surrounding countries. Nine hymenopterous parasites, three tachinid parasites, and a predaceous clerid have been found attacking the larvae, of which the most important is the tachinid *Ptychomyia remota*.

Further observations on the Malaysian coconut zygaenid (Artona catoxantha Hamps.), B. A. R. GATER (*Malayan Agr. Jour., 14 (1926), No. 10, pp. 304–320, pls. 9*).—This account continues that noted above. A diagram is given which shows the interrelations and relative importance of its parasites and hyperparasites.

The Cyprus processionary caterpillar (Thaumetopoea wilkinsoni Tams), D. S. WILKINSON (*Bul. Ent. Research, 17 (1926), No. 2, pp. 163–182, pls. 3*).—An account of this pest, known only in Cyprus, and of its natural enemies, which include 2 species of chalcid egg parasites that occasion a parasitism of over 17 per cent, and 3 species of tachinid larval parasites that sometimes occasion a parasitism of at least 30 per cent.

Sugarcane borer control aided through utilization of infested and trap corn, W. E. HINDS and H. SPENCER (*Louisiana Stas. Bul. 198 (1927), pp. 26, figs. 3*).—This is a report based upon work commenced in the fall of 1925.

The studies show that the sugarcane borer moths prefer to lay their eggs on thrifty-growing corn rather than on cane when such corn is available, and that the first two generations of the borers develop principally on corn in areas where corn is grown at all commonly. Borer hibernation occurs in the larval stage and larvae survive largely in the top trash which is left exposed on the surface of the ground. It appears that water standing in the furrows and covering such trash kills the borers therein, and that this water-controlling effect is more important than control by low temperatures during most winters in Louisiana. The thorough burial of trash, either before or after burning, is an exceedingly important factor in borer control and should apply to cornstalks as well as to cane trash. While the ordinary burning off of trash does not destroy more than one-third of the borer larvae therein, it exposes the surviving larvae to greater chance of destruction by water or by unfavorable climatic conditions, and the burning should be followed by such plowing under of unburned remnants as will prevent the emergence of moths therefrom.

Sugarcane borers produce five or six generations in Louisiana. There was practically no parasitic control of the first two generations on corn or cane in 1926.

In 1926 experiments approximately two-thirds of the borers present in infested corn were destroyed by one application of sodium silicofluoride by hand dusting methods. It is pointed out that four applications are necessary to cover development during the first two generations. Sodium silicofluoride applications are dissolved in dews and rains, thus washing the entire stalk. An increasing percentage of kill occurs during the first week after application and a diminishing percentage continues for more than another week, as described in the report

previously noted (E. S. R., 55, p. 455). The percentage of kill among fourth and fifth stage larvae in corn averaged as high as that for the first 3 larval stages.

Descriptions of new genera and species of Lepidoptera Phalaenae of the subfamily Noctuinae (Noctuidae) in the British Museum (Natural History), G. F. HAMPSON (*London: Brit. Mus. (Nat. Hist.), 1926, pp. 641*).—Detailed descriptions are given of new genera and species.

The European corn borer, W. C. O'KANE and P. R. LOWRY (*New Hampshire Sta. Tech. Bul. 33 (1927), pp. 39, figs. 6*).—This is a report of studies of the biology of the European corn borer, which has spread rapidly over southern New Hampshire, but has not reached marked intensity of infestation. Material brought from Massachusetts and wintered in New Hampshire showed relatively low winter mortality. The report includes data on pupation, pupal period, and emergence from overwintering larvae; preoviposition, oviposition, and postoviposition periods; and longevity of adults, number of eggs laid, and calendar range of egg laying; the details being presented in tabular form.

The progeny of the overwintering generation in the State exhibit both a one-generation and two-generation phase, the detailed records given showing the development of both phases, by instars. In observations extending over four years the two-generation phase was exhibited by larvae hatching before a critical date or period and the one-generation phase by larvae hatching after such date or period. In the experiments the development of larvae in the second generation was hindered by the coming of cool weather with the result that only part of the larvae were able to enter hibernation successfully, and in 1926 none of the larvae reached the instar stage necessary for successful hibernation. Only the larvae of the one-generation phase, representing but a fraction of the total, were entirely successful in reaching hibernation in good condition, and only such larvae gave rise to fully normal and healthy adults the following season.

Charts summarizing the life history data, year by year, from 1923 to 1926, are included.

Some caterpillars frequently mistaken for the European corn borer, C. J. DRAKE and G. C. DECKER (*Iowa Sta. Circ. 103 (1927), pp. 16, figs. 19*).—Popular descriptions are given of 20 lepidopterans the larvae of which are liable to be mistaken for the European corn borer.

The codling moth and its control, W. S. HOUGH (*Va. State Hort. Soc. Rpt., 31 (1926), pp. 128–131*).—A brief discussion based upon the conditions met with in Virginia.

The ecology of leaf-mining insect larvae, M. HERING (*Die Ökologie der Blattminierenden Insektenlarven. Berlin: Borntraeger Bros., 1926, pp. 253, pls. 2, figs. 66*).—This is an extended account of the habits and life of leaf-mining insect larvae in connection with 19 pages of references to literature.

The North American two-winged flies of the family Simuliidae, H. G. DYAR and R. C. SHANNON (*U. S. Natl. Mus. Proc., 69 (1927), Art. 10, pp. 54, pls. 7*).—The authors recognize 47 species and 2 races, representing 4 genera, occurring on the mainland of North America and Greenland. Of these 25 are described as new.

House fly fumigation in certain types of buildings, C. O. EDDY (*South Carolina Sta. Bul. 237 (1927), pp. 14, figs. 3*).—Following a discussion of the nature of calcium cyanide and its use, the author reports upon fumigation experiments in house fly control conducted in dairy barns, laboratories, shops, restaurants, grocery stores, drug stores, feed rooms, and homes. The rooms fumigated ranged in size from 1,000 to 64,000 cu. ft. with varying amounts of leakage, and were of various shapes and proportions.

The results obtained indicate that under conditions prevailing at Clemson College during the summer of 1926 the dosage needed in house fly fumigation averages 0.5 oz. for 1,000 cu. ft., being slightly less in large rooms with very little leakage if fumigation is done at night when the flies are in the upper part of the room, and more as the amount of leakage increases, the leakage being greatest in the smaller rooms. The dosage depends in part upon the duration of the exposure, it being advisable to use 3 to 5 hour exposures or longer when possible. It is believed that dosages higher than 1 oz. for 1,000 cu. ft. would probably never be warranted. Better results are usually obtained when the dust cloud method of application is used rather than the film method. This method of control is considered especially useful in large rooms, such as dairy barns, stables, stores, bakeries, packing houses, storerooms, and in many other places where other methods of control are not practical and economical. It is not recommended generally for household use.

The house fly: Its life history, importance as a disease carrier, and practical measures for its suppression, E. E. Austen (*Brit. Mus. (Nat. Hist.), Econ. Ser., No. 1A, 2. ed. (1926), pp. 68, pls. 3, figs. 6*).—This is the second revised edition of a pamphlet previously noted (E. S. R., 44, p. 255).

Investigations of the larvae of Tachinidae of the genera Sturmia, Winthemia, Carcelia, and Exorista [trans. title], W. R. Thompson (*Ann. Parasitol. Humaine et Compar., 4 (1926), Nos. 2, pp. 111–125; 3, pp. 207–227, pls. 2*).—The data here presented are in continuation of the investigations previously noted (E. S. R., 50, p. 848; 51, p. 763; 53, pp. 55, 159).

The American species of the tachinid genus Peleteria Desv. (Diptera), C. H. Curran (*Roy. Soc. Canada, Proc. and Trans., 3, ser., 19 (1925), Sect. V, pp. 225–258, pls. 2*).—Thirty-seven forms of Peleteria are recognized, of which 29 are described as new. A key for their separation is included.

Variability of the chrysomelid beetle Phaedon cochleariae F. [trans. title], T. K. Lepin (T. Liepin) (*Izv. Bûro Genetike i Evgenike* [*Akad. Nauk. S. S. S. R.*] (*Bul. Bur. Genetics and Eugenics*), *No. 4 (1926), pp. 59–96; Eng. abs., pp. 92–96*).—This is an account of work undertaken for the purpose of investigating the variability of an insect at various ages through all stages of its development. It was found that the variability of *P. cochleariae* F. gradually decreases with age, that males are more variable than females, and that unfavorable conditions cause an increase of variability.

The banana fruit-scarring beetle (Colaspis hyperchlora, Lef.), C. C. Gowdey (*Bul. Ent. Research, 17 (1926), No. 2, p. 137*).—An account of the eumolpid beetle, an attack of which causes severe injury to banana plantations in Colombia, British Guiana, Panama, Costa Rica, Guatemala, Nicaragua, British Honduras, and Mexico. This species attacks the fruit, leaf, and roots of the banana, the injury to the fruit being the most serious.

Control of the bronze birch borer by forest management, H. B. Peirson (*Jour. Forestry, 25 (1927), No. 1, pp. 68–72*).—A forest management plan for the control of *Agrilus anxius*, which attacks white birch, is discussed.

Entomological analyses of dying trees [trans. title], I. Trägårdh (*Meddel. Statens Skogsförsöksanst.* [*Sweden*], *No. 23 (1927), pt. 3, pp. 191–216; Eng. abs., pp. 213–216*).—A discussion of the bark and other wood-attacking beetles.

The strawberry root-weevils and their control in Oregon, D. C. Mote and J. Wilcox (*Oregon Sta. Circ. 79 (1927), pp. 24, figs. 13*).—This account relates to four root weevils that injure the strawberry in Oregon, namely, *Brachyrinus ovatus* L., *B. rugifrons* Gyll., *B. sulcatus* Fab., and *Dyslobus granicollis* Lec. Investigations conducted during the season of 1926 have shown that a homemade bait consisting of 95 lbs. of ground dried apple waste mixed with 5 lbs. of pow-

dered poison, and the commercial bait Go-West, will kill the adults of these weevils. Calcium arsenate has been found to be the most effective poison and is advocated for use in the homemade baits. It is recommended that the bait be applied at the rate of from a teaspoonful to a tablespoonful to a hill directly in the crown of the plant. The first application of the bait should be made when approximately 75 per cent of the weevils have changed to the adult stage, at which time they will be killed before ovipositing.

Control work conducted in Washington by Melander and Spuler has been noted (E. S. R., 55, p. 55).

A contribution to the study of the larvae of Curculionidae [trans. title], L. FALCOZ (*Min. Agr. [France], Ann. Epiphyties, 12 (9126), No. 3, pp. 109–129, pls. 8*).—In the introductory part of this account the author briefly considers the technique and terminology, following which, in the descriptive part, he takes up the genus Cleonus with the species *C. scabrosus* Brullé, *C. tigrinus* Panz., and *C. mendicus* Gyll.; the genus Lixus with the species *L. punctiventris* Boh.; the genus Ceutorrhynchus Germ. with the species *C. sulcicollis* Payk. and *C. quericola* Payk.; and the genus Baris with the species *B. chlorizans* Germ. A bibliography of 24 titles follows.

South Australian plant weevils, A. M. LEA (*Jour. Dept. Agr. So. Aust., 30 (1927), No. 6, pp. 582–598, figs. 27*).—This is a practical account of members of the Curculionidae that attack growing plants in South Australia.

The bean weevil [trans. title], J. FEYTAUD (*Rev. Zool. Agr. et Appl., 25 (1926), No. 11, pp. 161–172, figs. 4*).—A practical summary of information on the bean weevil.

Pollination and the honey bee, H. F. DIETZ (*Ind. Dept. Conserv. Pub. 52 (1925), pp. 20, figs. 8*).—The author discusses pollination, how it takes place, some conditions and their influence on insect pollination, pollination of fruits of the rose family, the legumes, the mint family, and the thistle family, and the honey bee as a pollinator.

The honey-bee and the fruit grower, A. E. LUNDIE (*Farming in So. Africa, 1 (1927), No. 10, pp. 384–387, figs. 4*).—A practical, illustrated account from the South African Division of Entomology.

Aphelinus mali, L. J. NEWMAN (*Jour. Dept. Agr. West. Aust., 2. ser., 3 (1926), No. 4, pp. 486, 487, figs. 3*).—A brief account of this parasite, which is now well established in most of the apple-growing districts of Western Australia.

A contribution to the study of the chalcidid parasites of Apanteles glomeratus L. [trans. title], C. FERRIÈRE and J. C. FAURE (*Min. Agr. [France], Ann. Epiphyties, 11 (1925), No. 4, pp. 221–234, figs. 5*).—The authors deal with the two species of Tetrastichus hyperparasites (*T. rapo* Walk. and *T. galactopus* Ratz.), *Homoporus luniger braconidis* n. var., and *Schizonotus pailloti* n. sp.

Further remarks on Ptychomyia remota Ald., a parasite of Artona catoxantha Hamps., B. A. R. GATER (*Malayan Agr. Jour., 14 (1926), No. 10, pp. 321–339, pls. 6*).—This is a report on the most important parasite of the Malaysian coconut zygaenid, with descriptions of the several stages of this tachinid, its life history, natural enemies, resistance to low temperature, etc.

A preliminary revision of some Charopsinae, a subfamily of Ichneumonoidea or ichneumon flies, H. L. VIERECK (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 19 (1925), Sect. V, pp. 259–273*).—This revision includes a key to the genera and species of the subfamily, with descriptions of 2 new genera and 17 new species of Campoplegidea.

ANIMAL PRODUCTION

Effect of diets upon growth, reproduction, and rearing of young with laboratory animals, J. O. Halverson (*North Carolina Sta. Rpt. 1926, p. 47*).—In continuing this study (E. S. R., 55, p. 260), alfalfa leaf and cod-liver oil have been added to all colony rations. More protein, both vegetable and animal, and wheat embryo in various quantities have also been added. Lots receiving additional wheat embryo did not thrive as well as those lots to which more protein was added in addition to the embryo. The former lots also contracted disease more readily. These additions reduced the age at which rats had their first litters from 128 and 129 days to 76 and 88 days. There was also a noticeable effect upon fertility of the females and the number of young per litter and also upon the percentage of infant mortality.

[Pasture investigations at the California Station] (*California Sta. Rpt. 1926, pp. 43, 44*).—An untillable field of between 35 and 40 acres was used for these investigations. The greater part of the forage consisted of burr clover and alfilaria, but bull thistle, star thistle, wild mustard, and fire weed abounded. During the season of 1924–25, from December 17 to July 18, this field furnished 11,445 cattle-days of feed that produced 7,865 lbs. of gain in weight. During the 1925–26 season, from March 1 to June 18, the same field gave 5,042 cattle-days of feed, producing 5,218 lbs. of gain in weight. Pasturing resulted in keeping down the foul growth appreciably. The star thistle especially made little bloom during the first grazing season.

Beef cattle feeding trials, 1921–24, C. E. Howell (*California Sta. Bul. 421 (1927), pp. 12, figs. 7*).—The results of four experiments are reported, all of which have been previously noted (E. S. R., 52, p. 71). In continuing the last experiment comparing calves and yearlings on alfalfa pasture, from May 25 to August 23, 24 calves made an average daily gain of 1.39 lbs. as compared to 1.41 lbs. average daily gain for 36 yearlings.

After August 23 barley was fed to both lots while on pasture. For 108 days of such feeding the calves made an average daily gain of 1.95 lbs. and the yearlings 2.02 lbs. The yearlings ate 8.46 lbs. of barley per head per day, which was 0.09 lb. more than the calves consumed. From the beginning of the experiment the calves increased their body weight 73 per cent, while the yearlings increased only 55 per cent.

[Experiments with beef cattle at the North Carolina Station], R. S. Curtis (*North Carolina Sta. Rpt. 1926, pp. 30–32*).—Two experiments are noted.

In the cooperative study of the factors which influence the quality and palatability of meat, steers fed cracked corn gained an average of 0.15 lb. more daily than those fed cottonseed meal, while heifers fed cottonseed meal made 0.21 lb. more average daily gain than those fed cracked corn. The steers fed corn dressed out 3.2 per cent more and the heifers 0.7 per cent more than the respective lots fed cottonseed meal. The steers finished on cottonseed meal gave outward indications of being as fat as those fed corn. There were indications that finishing on cottonseed meal produced meat of a darker color than finishing on corn.

Cattle on native pasture for a period of 91 days made an average daily gain of 1.16 lbs., while those on tame pasture from 106 to 145 days made 2.83 lbs. average daily gain. From these results it was deemed inadvisable to use native pastures unless supplemented with grain. Native pasture furnished forage until July 27, when cattle had to be removed.

Corn silage, alfalfa, corn fodder, minerals, and dirt for fattening two-year-old steers, J. M. Evvard, C. Culbertson, and W. E. Hammond (*Iowa Sta.*

Leaflet 21 (1927), pp. 12).—This is a more detailed report of work previously noted (E. S. R., 56, p. 863). The mineral mixture preferred by the authors consists of ground limestone 49.97 lbs., ground bone black 49.97 lbs., and potassium iodide 0.06 lb. Corn fodder was not equal to corn silage in producing gains, and steers fed fodder required more dry matter per unit of gain.

Finishing calves, yearlings, and two-year-old steers, C. C. CULBERTSON, J. M. EVVARD, and W. E. HAMMOND (*Iowa Sta. Leaflet 22 (1927), pp. 11*).—A comparison of the economy of fattening calves, yearlings, and 2-year-old steers is reported. The ration for all lots was the same, consisting of shelled corn, alfalfa hay, rock salt, and linseed oil meal. With the 2-year-old steers linseed oil meal was increased by 0.5 lb. each 30 days starting with 1 lb. until the steers were getting 2.5 lbs. The calves and yearlings received 1 lb. the first 30 days and 2 lbs. thereafter. The 2-year-old steers were fed for 120 days, the yearlings 210 days, and the calves 300 days. Hogs followed each group of steers and a check lot served to show the corn equivalent in the pick up.

At the end of 120 days the 2-year-old steers had made an average daily gain of 2.76 lbs., the yearlings 2.7, and the calves 2.49 lbs. The feed cost per 100 lbs. of gain was $11.11, $9.65, and $7.47 in the respective lots. The 2-year-old steers were marketed at this time and even though well finished showed a loss of $9.07 per head. If the yearlings and calves had been marketed, the yearlings would have shown a margin of $1.66 and the calves a —$2.39 margin. After 180 days of feeding the yearlings had made an average daily gain of 2.68 lbs. at a cost of $10.05 per hundredweight and would have returned a margin of $3.15 per steer over feed cost. The calves at this time would have returned a margin of 19 cts. At the end of 210 days the yearlings were marketed. Their average daily gain for the entire period was 2.43 lbs., the cost of 100 lbs. of gain $11.06, and the margin over feed cost —$1.70. The calves were continued on the experiment for 300 days. For the entire period they made an average daily gain of 2.15 lbs., cost $10.25 per 100 lbs. of gain, and returned a margin of $6.92 over feed cost. The corn saved by the hogs per 100 lbs. of gain was 36.33, 22.84, and 16.68 lbs. for the 2-year-olds; yearlings, and calves, respectively, for their full periods of feed. The dressing percentages for the various lots were 62.6 for calves, 61.54 for yearlings, and 59.91 per cent for 2-year-olds. The calves had the heaviest hides in proportion to weight and the 2-year-olds the lightest.

Roughages for fattening two-year-old steers, J. M. EVVARD, C. C. CULBERTSON, and W. E. HAMMOND (*Iowa Sta. Leaflet 23 (1927), pp. 12*).—The results of an experiment dealing with the value of certain roughages for two-year-old steers are reported.

Seven lots of steers averaging 1,115 lbs. per head were fed for 120 days. Lots 1 and 4 were fed standard rations, consisting of shelled corn full fed, cottonseed meal 3 lbs. daily for lot 1 and 2 lbs. daily for lot 4, alfalfa hay self-fed, and block salt self-fed. Lot 1 was full fed corn silage in addition. The ration in lot 2 was the same as in lot 1, except that no shelled corn was fed. In lot 3 the roughage consisted entirely of corn fodder, in lot 5 of red clover hay, in lot 6 of mixed clover and timothy hay, and in lot 7 of timothy hay and bright oat straw. Three hogs followed each group of steers, and a check lot of hogs was used to determine how much feed equivalent was recovered in the "pick up."

Corn silage proved to be a very efficient roughage. The cattle in lot 1 made the highest average daily gain of all lots (2.64 lbs.), attained a high finish, and returned the most profit after crediting the feed saved by the hogs. Eliminating the corn from this ration was unprofitable. The cost of 100 lbs. of gain in lot 2

was higher than in lot 1, and the animals did not attain the same degree of finish. The no-grain cattle dressed out 2.5 per cent less than the grain-fed cattle and showed 21 lbs. less internal fat. Corn fodder was clearly excelled by corn silage, alfalfa, and red clover hay. Mixed hay and timothy hay were inferior to either red clover or alfalfa hay. Based on the value for alfalfa hay of $20 per ton and crediting the feed saved by the hogs, one could afford to pay per ton for the roughages in the various lots $9.10 for silage, $2.41 for fodder, $22.45 for clover, $14.94 for mixed hay, and $1.55 for timothy and still return as much margin per steer over feed cost. The hogs following the cattle picked up a corn equivalent of from 7.62 per cent of the total ration in lot 7 to 12.98 per cent in lot 1.

Cottonseed meal, cold-pressed cake, and linseed-oil meal in rations for fattening cattle, H. M. Garlock (*Missouri Sta. Circ. 153 (1927), pp. 4*).—A review is made of experiments at several stations, in which linseed oil meal, cottonseed meal, and cold-pressed cottonseed cake were compared. Recommendations are made of the proper amount of protein supplement to feed to fattening cattle.

Cottonseed meal feeding investigations in progress, R. S. Curtis, J. O. Halverson, and C. D. Grinnells (*North Carolina Sta. Rpt. 1926, pp. 32–35*).—Three studies were continued (E. S. R., 55, p. 260) with cottonseed meal.

The first was to find the effect of graduated amounts on reproduction and lactation when fed with corn, minerals, and a good quality roughage. Cottonseed hulls formed one-third of this roughage. Four groups of 2 cows each were used. Group 1 received 50 per cent and group 4 100 per cent of cottonseed meal in the concentrates. The others received intermediate amounts. Five normal living calves were produced from all lots. The milk flow varied from average to good. One animal receiving a large amount of cottonseed meal became badly swollen and gaunt and was removed from the experiment.

Four groups of 3 calves each were used in the second study. All animals received minerals and 1 calf in each group received iron salts in addition. Wheat straw was the roughage used in this test. In group 1 receiving cottonseed meal 1 calf developed "fits" and died and 2 became partially blind, group 2 receiving linseed oil meal showed no bad effects, group 3 fed peanut meal was unthrifty and somewhat nervous, and group 4 on soy bean meal had 1 animal that became totally blind while the other 2 were apparently normal.

In still another study 3 groups of 2 heifers each were fed cottonseed meal as the entire concentrate part of the ration, with cottonseed hulls and timothy hay as the roughage portion. Minerals were supplied to all animals. No heifers died as a result of heavy cottonseed meal feeding, but 1 aborted. Two others, while producing milk after parturition, became lame due to swelling of the joints and finally refused to eat.

Type in beef calves, F. S. Hultz (*Wyoming Bul. 153 (1927), pp. 69–94, figs. 6*).—In order to determine (1) the effect of type upon economy of gain, (2) whether type or quality changes during a six months' feeding period, and (3) the relation between visual selection of type and certain body measurements, 40 high quality, nearly purebred Hereford calves were divided into 4 lots of 10 each. Lot 1 was designated as very low set, lot 2 as low set, lot 3 as rangy, and lot 4 as very rangy. This sorting was done by visual selection. Seven body measurements were taken at the beginning and the end of the experiment. All calves were fed a ration of corn, cottonseed cake, alfalfa hay, and sunflower silage.

The very rangy calves made the highest average gain and the very low set calves the lowest average gain. Changes in type during the feeding period

were greatest in lot 1 and least in lot 4. Three steers in lot 1 did not change type, while 3 steers in lot 4 changed type. Of the measurements taken the depth of chest, paunch circumference, and height at withers were most important in determining low setness. Calves with large paunches made the most rapid gains, but had a low dressing percentage. The very low set calves had the lowest shrink in shipping. This experiment showed little difference in the economy of production of very low set and very rangy calves. Tables and charts give the detailed results of the experiment.

[Investigations with sheep at the California Station] (*California Sta. Rpt. 1926, p. 44*).—Five lots of 49 lambs each were fed for 105 days on varying combinations of alfalfa hay, barley, cull raisins, raisin pulp, and bean screenings. In rate of gain the lot receiving bean screenings was practically equal to the lot getting straight barley, and because of the price of the concentrate proved a very economical ration. The lots receiving cull raisins and raisin pulp also made satisfactory gains.

A machine for breaking up raw fleeces preparatory for scouring has been constructed and found very satisfactory. A drier for drying scoured wool has also been built. Preliminary work on measurements of the diameters of wool fibers indicate that the diameters of fibers of purebred sheep may have as high a coefficient of variability as fibers from crossbred sheep.

Fattening western lambs, P. E. Miller (*Minnesota Sta., Morris Substa. Rpt. 1926, pp. 37, 38*).—Eight lots of 30 lambs each were fed for 63 days on various rations to compare corn and barley, shelled corn and ear corn, alfalfa hay and sweet clover hay, and the value of adding linseed oil meal to the ration. All lots received a full feed of grain and hay, approximately 2 lbs. of grain and 1 lb. of hay per head daily. The lots receiving oil meal were fed 0.2 lb. per head daily. Salt and water were available at all times. The lambs were housed in a shed to protect them from the weather and had access to open lots. One lamb in each of 3 lots died during the experiment, 2 from acute indigestion and 1 from pneumonia. The lambs used had a Merino foundation with a coarse-wool cross. Preliminary feeding consisted of grazing on pasture and stubble field, with a little hay and grain for 25 days.

The following table gives a summary of the work:

Feeds and gains of lambs, October 26 to December 28, 1926

Lot	Average initial weight	Average daily gain	Feed for 100 pounds of gain					
			Ear corn [1]	Shelled corn	Ground barley	Oil meal	Alfalfa	Sweet clover hay
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
1	71.4	0.33	480.5				421.2	
2	70.6	.39	402.8			51.4	355.7	
3	70.7	.36		434.5			367.2	
4	71.0	.42		378.6		47.4	320.2	
5	70.6	.30			546.8		450.6	
6	70.8	.34			467.9	58.5	400.9	
7	70.8	.32			521.5			455.6
8	70.5	.35			440.3	56.4		405.5

[1] Ear-corn weight was figured on shelled-corn basis. Both ear and shelled corn were of the 1925 crop.

[Swine feeding experiments at the North Carolina Station], E. H. Hostetler (*North Carolina Sta. Rpt. 1926, pp. 35–41, figs. 2*).—The results of experiments, part of which have been continued (E. S. R., 55, p. 263), are noted.

[*Experiments at the*] *Swine Research Farm, Raleigh*, J. T. Keesee.—Four lots of 8 pigs each averaging 40 lbs. in weight were fed to compare different methods of utilizing pasture. Lots 1, 3, and 4 were fed a limited corn ration, and lot 2 was full fed. All lots received fish meal one-half and linseed oil meal one-half and minerals, all self-fed as supplementary feeds. Lots 1 and 2 were grazed on a temporary pasture of orchard grass and clover, lot 3 on alfalfa, and lot 4 on soy beans. The number of days required to reach 200 lbs. in weight were 154, 108, 132, and 142 days in the respective lots. The feed required per 100 lbs. of gain regardless of pasture was 367, 381, 346, and 344 lbs., respectively.

Thirty-two sows weaned 384 pigs during the year. The total cost of feed and labor was $1,482.90, making the average cost per pig at weaning time $3.86.

[*Experiments at the Upper Coastal Plain Substation, Rocky Mount*], R. E. Currin, jr., and L. O. Page.—Two varieties of corn were used in a trial for hogging down with 20 100-lb. pigs when the corn was in the dough stage. The Norfolk Early Market variety produced 330 lbs. of pork per acre with the addition of 72 lbs. of supplementary feed. The Jarvis Golden Prolific variety produced 542 lbs. of pork per acre with the addition of 158 lbs. of supplementary feed. The supplementary feed consisted of fish meal and minerals self-fed. Each bushel of immature corn was marketed through the hogs at $1.30

Cottonseed meal proved very successful for replacing one-half of the fish meal in a dry lot ration of shelled corn, fish meal, and minerals self-fed free choice. The 25 80-lb. pigs fed the fish meal alone made an average daily gain of 1.44 lbs., while those in which one-half of the fish meal was replaced by cottonseed meal made 1.52 lbs. average daily gain. The feed required per 100 lbs. of gain was 319 and 302 lbs. by the respective lots. No ailments common to cottonseed meal-fed pigs were noticeable.

One acre of standing corn and soy beans plus 160 lbs. of protein and mineral supplements produced 484 lbs. of pork with 67 pigs weighing 41 lbs. each at the beginning of the experiment.

[*Experiments at the Black Land Substation, Wenona*], J. L. Rea, jr., and A. P. Lefevers.—Soy bean oil meal can replace one-half of the fish meal in a dry-lot ration consisting of corn, minerals, and protein supplement self-fed free choice. In two trials, however, the cost of 100 lbs. of gain averaged 21.5 cts. higher in the lot receiving soy bean oil meal. In one trial no bad effects were noticed, but in the second trial 3 pigs in the lot receiving soy bean oil meal after 28 days on feed developed symptoms similar to paralysis. After 42 days of feeding 15 pigs in this lot and 8 pigs in the other lot were similarly affected. Access to rye pasture for a few hours each day corrected this condition.

Report on soft pork experiments in progress, E. H. Hostetler and J. O. Halverson.—Attempts were made to determine what feeds and how long it would take for these feeds to harden the fat of pigs fed large quantities of peanuts. Corn and cottonseed meal (6:1) did not produce uniform or satisfatory gains nor harden carcasses sufficiently on pigs of either 65 or 35 lbs. initial weight. Ground milo and supplements made fairly satisfactory gains and produced carcasses which graded from medium hard to medium soft. Pigs fed sweet potatoes with a grain mixture did not produce hard carcasses.

[**Feeding value of pepper by-products**] (*Georgia Sta. Rpt. 1926, pp. 149–151*).—The hulls or fleshy part of the pimento pepper run about 88 per cent, the stems 87 per cent, and the seed 48 per cent water. The ash of the flesh has 32.5 per cent potash and 15 per cent phosphoric acid. Peppers also contain some sugars, which, when combined with other constituents, made a fairly satisfactory feed for swine.

When ripe sweet peppers made up a large part of the ration of laying hens, the yolks of the eggs became a deep reddish yellow as though the eggs had been partly incubated. It is thought that this fact may be put to use by feeding peppers to hens getting little green feed, at which time the yolks of the eggs are very pale.

Pastures for hogs, L. A. WEAVER (*Missouri Sta. Bul. 247 (1927), pp. 44, figs. 8*).—This is a compilation of the results of experiments at this and other stations of the adaptability and relative value of various pasture crops for hogs and the amount and kind of grain or concentrate to feed on pasture (E. S. R., 54, p. 760).

Soft pork investigations (*Georgia Sta. Rpt. 1926, pp. 131–134*).—This is the report of the first test of the metabolism feeding experiment in connection with work previously noted (E. S. R., 55, p. 161). Five pigs were used in the test. One was killed at the start as a check. Two others were individually fed a limited amount of corn and tankage, and the other 2 similarly fed shelled velvet beans and tankage. The feeding period ran for 120 days, during which time there were two periods of 14 days each, in which 1 pig from each lot was fed in metabolism crates.

During the metabolism period it was found that the pigs fed velvet beans had a higher nitrogen excretion than those fed corn. Their urine also contained more "solids" than that of the corn-fed pigs. Quantitative tests of the urine for 3–4 dihydroxyphenylalanine and other phenol bodies were both positive in the urine of the velvet bean fed pigs.

Samples were taken from 10 different regions of the bodies of the 5 hogs and were used for histological studies. The hams, shoulders, and sides were cured for studying the quality of the meat. A very noticeable feature of this experiment was that the livers of the velvet bean fed pigs were considerably heavier than those of the pigs fed corn.

The lot feeding work indicated that the velvet beans were a useful feed in fattening swine, and that the amino-acid deficiency could be corrected by the use of suitable protein supplements. Soaking does not improve velvet beans, and no evidence was found of vitamin deficiency. Velvet beans produced fat that graded between medium soft and medium hard, but this condition could be corrected by a finishing period on corn.

Seventy-five lb. pigs were fed for eight weeks on peanuts, followed by a hardening period on corn. It is concluded that such pigs can not be hardened in a reasonable period, but that they will eventually harden if the period is extended long enough.

The feeding of chufas produced soft pork, but so far the period necessary to harden such pork has not been established.

Farm poultry raising, M. A. JULL (*U. S. Dept. Agr. Farmers' Bul. 1524 (1927), pp. II+28, figs. 21*).—This is a revision of and supersedes Farmers' Bulletin 287 (E. S. R., 19, p. 71).

[Poultry investigations at the California Station] (*California Sta. Rpt. 1926, p. 81, 91, 92*).—Investigations by J. E. Dougherty showed that exposure of eggs to temperatures of from 28 to 32° F. for three successive nightly periods of 14 hours each had no significant effect upon hatchability. This exposure plus a continuous exposure of 38 hours at the same temperatures also had no effect. When the nightly exposure was increased to four and these were followed by a continuous exposure of 38 hours, there was a significant reduction in the percentage of eggs hatched.

Experiments with root crops at Petaluma show that the Yellow Giant and Danvers Half-long (red) varieties of carrots have as much vitamin A as the

commonly used green feeds. The White Belgian carrot and the Purple Top White Globe and American Purple Top Swede turnips have small amounts of vitamin A, but not in quantities sufficient to substitute for green feeds. Mammoth Long Red, Golden Tankard, and Half Sugar mangels (white) are of no value.

Salmon oil made from canner refuse, consisting of heads, tails, fins, and viscera, including the liver, proved a good source of vitamins A and D. Pullets fed dry mash containing 2 per cent of this oil showed no evidence of leg weakness after 96 days of feeding. Chicks fed for 12 weeks on a mash containing 2 per cent of the oil and not exposed to direct sunlight did not develop leg weakness.

[Poultry investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1926, pp. 51-53*).—The results of one year's work (E. S. R., 55, p. 467) indicate that cottonseed meal may have a place in the ration for laying hens. However, the pen fed 38 per cent of cottonseed meal in the mash produced eggs badly affected by the cottonseed meal spot. The yolks of these eggs gradually turned black when stored, so that by the end of a week they were almost entirely black.

[Experiments with poultry at the North Carolina Station], B. F. KAUPP and R. S. DEARSTYNE (*North Carolina Sta. Rpt. 1926, pp. 70-72, 74, 75*).—The results of some experiments are briefly noted, several of which are continuations of work previously noted (E. S. R., 55, p. 265).

Fish meal v. *meat meal in egg production.*—Fish meal and meat meal were found to be practically equal pound for pound as a source of protein for egg production in Single Comb White Leghorns in a 9-month test. The percentage production for the fish meal flock for the entire test was 49 and for the meat meal flock 51.

Mineral requirements in egg production.—Mineral supplements were taken from a group of laying hens on May 1. The percentage production for this group for April was 70, for May 50, and for June 25. On July 1 the supplement was resumed, and during this month the production averaged 32 per cent. In another group all the supplements except limestone grit (containing 97 per cent of calcium carbonate) was removed May 1. The average percentage production of this group for April was 58, for May 53, and for June 32, and when the supplement was resumed on July 1 the production rose to 42 per cent.

Relative value for growth of condensed buttermilk, dried buttermilk, meat meal, and fish meal.—A continuation of this study with chicks showed that fish meal gave the lowest cost per pound of gain, followed by dried buttermilk, meat meal, and condensed milk in the order named. It required 4.16, 3.2, 4.7, and 3.7 lbs. of the respective feeds to produce a pound of gain from hatching to 8 weeks of age.

Normal hematology of fowls.—Hemoglobin readings were made on over 2,000 normal birds. These studies indicated a diminishing of hemoglobin during heavy lay and suggested the necessity of supplying iron salts during this period.

Commercial unit experimental flock.—A study of this type of flock showed a death loss of 4.9 per cent during the first 9 months. The flock of 750 hens consumed 23.9 tons of mash and grain, produced 7,960 doz. eggs, requiring 5.9 lbs. of feed per dozen eggs. The return over feed cost was $2,192.86.

The cost of putting pullets into laying.—The hatch in a milk fed lot was 70 per cent and in a meat meal lot 54.8 per cent. The pullets in both lots began to lay at 20 weeks of age. However, the first pullet to lay in the milk fed lot was 4 days ahead of the first pullet in the meat meal lot. The average weight of chicks in this test at 8 weeks of age was 1.63 lbs. in the milk lot and 1.17 lbs. in the meat meal lot. The feed cost of 100 broilers at 8 weeks of

age in the milk fed lots was $14.39 and in the meat meal lot $9.36. The feed cost per pullet for the first 20 weeks was 60 and 44 cts. in the respective lots.

Effect of turning eggs on hatching.—The tests indicate that turning eggs six times a day from setting to the eighteenth day will give an average of 16.5 per cent greater hatch of all eggs than turning once a day.

Experiments in fattening poultry.—The results of two tests have shown that a simple ration of corn meal and pulverized oats fed with buttermilk or sour skim milk gave as good and more economical gains than a more complex ration of fish meal, wheat shorts, pulverized oats, and corn meal.

Feeding baby chicks, H. L. Kempster (*Missouri Sta. Circ. 154 (1927), pp. 4*).—The author describes in a popular manner the various feeds and their functions in a ration for baby chicks. The steps in feeding are discussed in order from hatching to several weeks of age. A feeding schedule is appended showing the details of feeding up to maturity.

Caponizing the surplus cockerels, R. T. Parkhurst (*Idaho Sta. Circ. 47 (1927), pp. 7, figs. 4*).—Popular directions are given, and the operation is discussed.

1927 announcement of prices of breeding stock, hatching eggs, and baby chicks (*Idaho Sta. Circ. 42 (1927), pp. 4, figs. 2*).—The prices of hatching eggs, baby chicks, and breeding cockerels of six different breeds are announced in this publication.

DAIRY FARMING—DAIRYING

Experiments in the self-feeding of dairy cows, W. B. Nevens (*Illinois Sta. Bul 289 (1927), pp. 425–452, figs. 19*).—In continuation of this study (E. S. R., 56, p. 375), it was found that cows tended to eat much more feed than was required for maintenance and milk production when fed in this manner. This increased feed consumption tended to increase body weight. No harmful effects resulted from self-feeding if the animals were gradually accustomed to the change. This method of feeding is deemed useful in studying the relative palatability of feeds, but cows showed a variation in preference for feeds at certain periods. The practice is not recommended for practical milk production.

Soybean meal and ground soybeans as protein supplements for dairy cattle, A. E. Tomhave (*Delaware Sta. Bul. 148 (1927), pp. 19*).—After a review of the literature, two experiments are recorded.

Soy bean meal v. peanut meal.—Four cows were fed by the reversal method in one trial and 8 cows in a second trial for four 24-day periods, the first 3 days of each being considered preliminary. During the first and third period peanut meal was used as the protein supplement to the ration, and soy bean meal was used during the second and fourth periods. The grain ration consisted of yellow hominy, wheat bran, and salt fed at the rate of 1 lb. to 3.5 lbs. of milk produced. Alfalfa hay was fed at the rate of 1 lb. for each 100 lbs. of live weight and silage at the rate of 3 lbs. for 100 lbs. of live weight.

The daily milk production while on peanut meal was 2.98 lbs. above normal and for the soy bean periods 2.09 lbs. above normal. The cows gained 42 lbs. more in weight during the soy bean meal feeding than during the peanut meal periods. In this experiment peanut meal proved to be 3.44 per cent more efficient for milk production than soy bean meal.

Ground soy beans v. peanut meal.—The plan of this experiment was similar to the above, except that 28-day feeding periods were used. In trial 1 of this experiment 8 cows were fed for 2 periods, the first using ground soy beans and the second peanut meal as a protein supplement. In trial 2, 6 cows were

fed for 2 periods and 3 of these for 4 periods using peanut meal in the first and third and ground soy beans in the second and fourth periods.

The daily variation from normal during the ground soy bean period was −0.38 lb. and during the peanut meal period +0.39 lb. of milk. Peanut meal proved to be 2.74 per cent more efficient in producing milk than ground soy beans. Three cows gained 151.4 lbs. in weight while being fed ground soy beans and lost 42.7 lbs. while on peanut meal.

[Dairy cattle investigations at the California Station] (*California Sta. Rpt. 1926, pp. 41, 42, 62*).—The results of experiments are briefly noted.

Fresh orange pulp had no appreciable effect on increasing the quantity or quality of milk produced. The apparent digestibility of dried orange pulp as determined by feeding trials indicated a total of about 78 lbs. of digestible nutrients per 100 lbs. of dry matter, including about 70 lbs. digestible carbohydrates, about 0.8 lb. digestible fat, and 6 lbs. digestible protein.

Experiments were conducted with house flies, horn flies, and stable flies to determine their effect upon milk production and also the value of fly repellants. One month's confinement with heavy infestation showed the following losses in production: Horn flies 1.4 per cent, house flies 3.33 per cent, and stable flies 9.26 per cent. A continued infestation with flies with daily sprayings of a bland nontoxic oil showed a loss of production with horn flies of 13.1 per cent and with stable flies of 21 per cent. With a combination of oil and pyrethrum spray, the controls without flies lost 4.3 per cent and the cattle infested with horn flies 12.4 per cent.

Studies by C. L. Roadhouse, W. M. Regan, and S. W. Mead showed that alfalfa, when in the form of hay, pasturage, or green, produced a marked flavor in the milk if fed within 5 hours before milking. The hay produced the least noticeable flavor. The most prominent flavor resulted from feeding freshly cut alfalfa 2 hours before milking and the flavor diminished as the period before milking lengthened. In one test cows produced distinctly flavored milk the first week on alfalfa pasture feeding. A grain mixture with alfalfa did not modify the flavor of the milk.

[Experiments with dairy cattle at the New Mexico Station] (*New Mexico Sta. Rpt. 1926, pp. 47–50*).—The results of two experiments are briefly noted.

Pasture experiments.—Sweet clover made a satisfactory pasture crop for dairy cows. Planting in February furnished forage beginning about the first or middle of May and lasting to the middle of October. Second-year growth can be used as early as April 1 and furnishes good pasture until the last of July.

Italian rye grass sown from the middle of September to the last of October furnished excellent grazing for dairy cattle during the spring and fall months and good grazing during a large part of the summer. Italian rye grass produces pasture the second year without reseeding and does not head out as early as rye.

Cotton seed for dairy cows.—During a 24-day period 4 cows fed whole cottonseed and bran equal parts, with all the alfalfa hay they would consume, produced 2,903.7 lbs. of milk and 124.36 lbs. of butterfat. The total production of milk when fed corn and bran was 2,957.5 lbs. and of butterfat 115.68 lbs. While on whole cottonseed the cows ate 7.2 lbs. less alfalfa than while on corn. This test indicates that whole cottonseed can be used to replace part or all of the corn in the ration for at least a short period.

Phosphorus deficiency and a dairy cattle "disease," E. B. Hart, B. A. Beach, E. J. Delwiche, and E. G. Bailey (*Wisconsin Sta. Bul. 389 (1927), pp. 10, figs. 4*).—Cattle in certain sections of Wisconsin are some times affected with a "mysterious disease," which shows the following symptoms: Extreme

emaciation, stiffness in the hind quarters and at times in the front quarters, swollen joints, harshness of coat, unthrifty condition, and perverted appetites. The shoulder blade of a slaughtered animal was found to be as thin as paper in places, and a knife could be run through it. The sections where cattle are affected have plenty of lime in the soil, so it was thought that lack of phosphorus might be the cause.

Six cows suffering from the disease were divided into two lots and fed rations containing liberal amounts of phosphorus. Ration 1 consisted of corn silage, alfalfa hay, and a grain mixture of yellow corn, ground oats, wheat bran, and oil meal 7:7:5:1. One cow in this group received, in addition, 0.25 lb. of cod-liver oil daily. Ration 2 consisted of mixed hay, corn silage, and a grain ration of ground oats, yellow corn, and steamed bone meal 9:10:1. One cow in this group also received cod-liver oil.

After three months on these rations all cows had gained over 200 lbs. in weight and increased 50 per cent in milk production. Neither ration was superior to the other, and the cows receiving cod-liver oil showed no particular advantage. Rations containing such feed as wheat bran, wheat middlings, linseed oil meal, and cottonseed meal prevent the occurrence of this disease. Bone meal and spent bone black also eradicate this condition. Analyses of sweet clover and alfalfa hay from the affected regions show that they contain from 2.25 to 3.15 per cent CaO, but only 0.2 to 0.328 per cent P_2O_5. It is necessary to feed some of the above feeds when cattle are on such pasture.

Measures of persistency of lactation, W. L. Gaines (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp. 373–383, fig. 1*).—A review is made of several methods of measuring persistency of lactation. The measure preferred by the author is $\frac{dy}{dt}=ae^{-kt}$ in which y represents yield, t the time from calving as origin, $\frac{dy}{dt}$ is the rate of yield, a is a constant representing the initial rate of yield, e is the base of natural logarithms, and k is a constant representing the rate of decrease in the yield as proportional to the rate of yield of the moment. Formulas for fitting the equation by least squares are given in simplified form for the special cases of 7, 9, and 11 monthly records.

Persistency of lactation in dairy cows, W. L. Gaines (*Illinois Sta. Bul. 288 (1927), pp. 353–424, figs. 31*).—The formula noted above has been fitted to 1,534 Guernsey records and 1,395 Holstein records. The rate of yield shortly after calving and the rate of decrease are quite closely correlated. For the Guernsey records r equals 0.535 and for the Holstein records r equals 0.433. In both breeds the rate of yield after calving increased up to nine years and then declined. Yearly yield is more closely related to rate of yield after calving than to rate of decrease in yield, as r=0.672 and −0.226, respectively. The coefficient of variability in persistency values shows a variability for the Guernsey and Holstein records of 60.97 and 46.25, respectively, and the corresponding coefficient for yearly yield as affected by persistency of 14.53 and 13.05. The mean initial rate corrected to age of maximum is for Guernsey records 47.2 lbs. and for Holstein records 81.6 lbs. of 4 per cent milk per day. Holstein records showed greater persistency than the Guernsey records.

Environment has a great effect upon persistency. Half sisters by Guernsey sires showed no correlation, half sisters by Holstein sires a slight correlation. Half sisters by a common dam showed a marked correlation for both breeds. Dam and daughter relationships showed marked correlation, but full sisters in both breeds a nonsignificant negative correlation. From the mathematical treatment of these data it seems that for the ordinary 10 months' lactation

period the best time to conduct a short-time test to determine lactation yield is 4.2 months after calving.

Butterfat tests of first and later lactations, C. F. MONROE (*Ohio Sta. Bimo. Bul., 12 (1927), No. 2, pp. 34–38, fig. 1*).—Station records of the butterfat percentage for the first lactation period and for the lifetime were studied to determine what relationship existed between them. The records of 32 Holstein and 30 Jersey cows were used for this study. It was noted that there was a tendency for the first test to be higher. This occurred in 19 of the 32 Holsteins and 19 of the 30 Jersey records.

For the Holsteins, 19 of the first test were within 0.1 per cent (either under or over) of the lifetime test. A variation of 0.2 per cent included 28 records, and of the remaining 4, 2 showed a variation of 0.21, 1 of 0.45, and 1 of 0.4 per cent. In the Jersey records, 14 of the 30 cows showed a variation of 0.1 per cent. A variation of 0.2 per cent included 22 cows, and of the remaining 8, 3 varied less than 0.3, 3 less than 0.4, and the other 2, 0.44 and 0.69 per cent, respectively.

A comparison of the methylene blue reduction test and the agar plate count for determining quality of milk, H. B. ELLENBERGER, M. C. BOND, A. H. ROBERTSON, and R. I. MOODY (*Vermont Sta. Bul. 264 (1927), pp. 32, figs. 15*).—Since no exact measure to apply for determining quality in milk is known, comparison was made of the methylene blue and agar plate methods by ascertaining the uniformity or variability of duplicate tests made according to standard methods and determining the correlation between them and the keeping quality of the milk. The milk samples were collected from individual cows in four herds close to the station, and the keeping quality of the milk was measured by the time required to become unfit for table use and by acid development.

As previously reported (E. S. R., 56, p. 570), the methylene blue test gave the more consistent results. The average coefficient of variation for the plate counts was 32.61 and for the reduction test only 4.61. The coefficient of correlation for the keeping quality of 268 samples for the agar plate counts was -0.28 ± 0.04 and for the reduction time $+0.72\pm0.02$.

The trier method of sampling butter for analysis, H. B. ELLENBERGER and J. A. NEWLANDER (*Vermont Sta. Bul. 265 (1927), pp. 28, figs. 5*).—Comparisons were made in this study of factors affecting the accuracy of the trier method and also the value of this method as compared to the wedge method.

Trials were made in which the free water on the back of the trier was included in the sample, when it was excluded, and when no attention was paid to it. In 41 trials when the free water was excluded the samples averaged 0.25 per cent less water than when the water was included and 0.69 per cent less than the wedge samples. In 113 comparisons it was found that when no attention was paid to the water on the trier these samples averaged 0.16 per cent less moisture than when the water was included and 0.60 per cent less than did the wedge samples. In 122 samples when the water was included the moisture content averaged 0.44 per cent less than the wedge.

Trials with 15 different triers showed that the highest and most accurate results when compared to wedge and whole tub samples were given by triers whose curvatures were nearest to that of a true arc or slightly more contracted.

It was found that samples taken by the trier method at 20° F. showed approximately 0.5 per cent less moisture than did those drawn at 60°. The authors recommend relatively high temperatures when butter is to be sampled by this method. The wedge method of sampling is more accurate when compared to whole tub analysis, but if triers of correct construction are used very accurate results may be obtained.

Preparation of butter samples for analysis, J. A. Newlander and H. B. Ellenberger (*Vermont Sta. Bul. 263 (1927), pp. 31*).—In continuation of this study (E. S. R., 56, p. 570), three variations of the Official method, the factory method, and the stirrer method were used. The two latter methods allowed moisture losses to occur, and the analytical results were too low. If samples are carefully prepared and accurately tested, 90 per cent of the duplicates should check within 0.05 per cent and there should be few variations over 0.1 per cent.

The authors recommend two methods for preparing butter samples for analysis and suggest method 1 for less experienced operators. This method consists of softening the sample in a closed vessel at as low temperatures as posisble to avoid oiling off and separation, until thin enough for agitation. Cool and shake until a semisolid mass is obtained. Open and stir with a spatula until the sample has the consistency of smooth, soft grease. Weigh out the sample and analyze it at once or, if preferred, hold in air temperature of between 21 and 27° C (69.8 and 78.6° F.) and restir before weighing. The procedure of the second method is to hold the sample in a closed container in a warm room (26 to 28°) until the mass is soft, then open and stir as in first method and weigh out the sample for analysis.

[**Experiments with dairy products at the California Station**] (*California Sta. Rpt. 1926, pp. 62, 63, 64*).—G. D. Turnbow et al. found that prunes and figs could be used satisfactorily in the manufactnre of ice cream. The Calimyrna pie grade fig was superior to other varieties tested. It was found that gelatin exerted more influence on the viscosity of the mix than any of the other ingredients. The viscosity as determined by the MacMichael viscosimeter had little to do with the control of weight or density of the finished ice cream.

A. W. Farrell found that paints, greases, and other protective preparations were effective in protecting dairy equipment and metals after one year's exposure in a dry atmosphere, except metal lacquer and shellac. Of those exposed in a moist briny atmosphere, the heavy greases gave excellent protection. Red lead and a mixture of white lead and tallow gave excellent protection, while paints with a graphite or graphite and red lead base gave good protection. Fair results were secured with heavy oils and natural asphalt base paints, while light oils were less satisfactory.

A new type of electric heater for dairy sterilizers was developed by Farrell, which requires a minimum amount of water, but heated this water to a temperature of 170° F. in 20 per cent less time than one and 57.5 per cent less time than other types of heaters studied. A 3 kw. heater is sufficient for ordinary purposes, but a 5 kw. heater saved time, was as economical to operate, and offered reserve capacity for nse in cold weather. The time required for electrical sterilization compared favorably with that required by kerosene heaters, and the electrical heater is as practical and as economical. The energy required per batch sterilized varied from 2.02 to 3.48 kw. hours.

In a study of the Babcock test by D. H. Nelson, it was found that the temperature of the room in which the tests were read did not cause any appreciable change in the readings. Samples read in a room having a temperature of 19° averaged 0.019 per cent below the readings obtained when the temperature was 84°. When the temperature of the centrifuge was 100°, 32 samples averaged 0.049 per cent above the Mojonnier, but when the centrifuge was heated to 130° the same samples averaged 0.07 per cent above. An increase of one-third in the speed of the centrifuge gave 0.02 per cent increase in the reading, and a two-thirds increase in the speed gave 0.031 per cent increase.

C. A. Phillips found that the texture of Cheddar cheese was not affected by pasteurizing milk of good quality by the flash method of 165° temperature. The flavor was improved slightly after the cheese was from 2 to 3 months old.

Investigations by F. H. Abbott showed that butter cut with a worm gear cutter lost 0.48 per cent more moisture during 13 days' storage than did butter cut with the wire type cutter during the same period of storage.

VETERINARY MEDICINE

[Report of work in veterinary science at the California Station] (*California Sta. Rpt. 1926, pp. 88–91, 92, 93*).—In a report of work by F. M. Hayes and E. H. Barger with infectious abortion, the spread of the disease in the University Farm herd at Davis is considered to illustrate the impracticability of trying to control abortion where positive and negative cows are kept together. The milk of 56 cows was studied at regular intervals with relation to agglutinins in the milk and blood serum. The inoculation of guinea pigs disclosed the presence of *Bacterium abortus* in the udder of 14 of the cows having positively agglutinating milk and in 13 of those having milk with no agglutinins, thus showing that the agglutination test of milk is of no great value in detecting an udder that contains *B. abortus*.

In vaccination work with the live abortion germ vaccine 15 cows at Berkeley thus treated between December 18, 1923, and October 14, 1924, had given birth to normal calves at the end of the first gestation period following vaccination. Eleven of these had also terminated a second gestation period normally, and one aborted, from which *B. pyogenes* was isolated, while cultural examinations and guinea pig inoculations for *B. abortus* were negative. Most of these cows were pregnant for the third time since vaccination. Of the 10 cows which gave off *B. abortus* in the milk following treatment while in lactation with live abortion germ vaccine, as reported the preceding year (E. S. R., 55, p. 371), 4 again became positive for *B. abortus* in the milk after having given birth to normal calves. An attempt to remove foci of *B. abortus* infection from one of these cows through the intravenous administration of a 1 per cent mercurochrome solution in increasing doses proved negative.

It is stated that 17 cows and 13 calves were treated with cultures of the bile-treated tubercle bacilli.

Efforts to improve the present method of preparing chicken-pox vaccine have given encouraging results. In a series of 35 experiments, involving several hundred birds, uniform success in conferring complete resistance to artificial infection with chicken-pox virus 4 weeks after vaccination was secured. The vaccine was prepared from fresh lesions and tissue removed from the combs of cockerels 10 to 12 days after severe inoculation with chicken-pox virus. This vaccine has been found to remain potent for from 60 to 90 days after preparation. Evidence has been obtained to show that immunity may last for at least 6 months. That this type of vaccine is not dangerous to use has been demonstrated by the vaccination of approximately 10,000 birds on poultry farms without any harmful results.

In work to determine the accuracy of the agglutination test in detecting fowls that are carriers of *B. pullorum* infection, 88 reactors to a test made in October, 1925, were tested monthly since December of that year. The results show a considerable variation in the reaction to the test. In an attempt to discover a method of overcoming the cloudiness which frequently results in making agglutination tests with chicken-blood serum, a comparison was made of antigens preserved with phenol and with formalin, the latter giving the better

results. All of the sera that reacted with the phenolized also reacted with the formalized antigen.

During the year agglutination tests for *B. pullorum* were made of 36,273 blood samples from 108 flocks, of which 5.9 per cent gave positive reactions.

Work by W. H. Boynton in hog cholera vaccination of baby pigs indicates that it is of little use to try to immunize pigs either by the serum-virus or by the vaccine method while they are nursing immune mothers. The milk from such mothers seems to have some influence in preventing the nursing pigs from developing antibodies against hog cholera. The greatest success seems to be obtained soon after the pigs are weaned, which is at about 6 weeks of age.

The important protozoal diseases of useful animals in Germany, A. Koegel (*Die Wichtigsten durch Protozoen Verursachten Nutztierkrankheiten in Deutschland. Stuttgart: Ferdinand Enke, 1926, pp. VIII+107, figs. 76*).—This is a practical résumé of information on this subject.

[Annual reports of proceedings under the Diseases of Animals Acts for the years 1924 and 1925], S. Stockman and J. R. Jackson (*[Gt. Brit.] Min. Agr. and Fisheries, Ann. Rpts. Proc. Diseases Anim. Acts, 1924, pp. 70; 1925, pp. 126, figs. 5*).—Included in these reports (E. S. R., 53, p. 380) are accounts of occurrences of foot-and-mouth disease, rabies, sheep scab, swine fever, anthrax, glanders, parasitic mange of horses, tuberculosis, swine erysipelas, and epizootic abortion in cattle.

Plants poisonous to live stock in Montana, H. E. Morris and H. Welch (*Montana Sta. Circ. 134 (1927), pp. 28, figs. 14*).—This is a practical account of the more important plants poisonous to livestock. The symptoms produced are mentioned and treatment given.

Feeding of Drymaria and Euphorbia to steers (*New Mexico Sta. Rpt. 1926, p. 55*).—Experiments conducted following the death of cattle on a ranch near Three Rivers, N. Mex., previously noted (E. S. R., 57, p. 79), led to the feeding of plants supposed to be the cause of the loss to two steers, in neither of which was any ill effect produced.

Diseases of animals communicable to man, V. A. Moore (*Amer. Jour. Pub. Health, 17 (1927), No. 2, pp. 113–120*).—Diseases considered in the course of this discussion include anthrax, glanders, rabies, tuberculosis, Malta fever, undulant fever, swine erysipelas, *paratyphoid bacillus in cattle, tularemia, foot-and-*mouth disease, cowpox, infectious jaundice, etc.

Brucella abortus infection in a woman, G. N. Belyea (*Jour. Amer. Med. Assoc., 88 (1927), No. 19, p. 1482*).—This is a report of a case observed at Bellingham, Wash.

Experimental investigations of the plurality of the foot-and-mouth disease virus.—A preliminary contribution [trans. title], O. Waldmann and K. Trautwein (*Berlin. Tierärztl. Wchnschr., 42 (1926), No. 35, pp. 569–571*).—In work with 32 strains of foot-and-mouth disease virus obtained from different sources the authors have detected 3 main types and a number of variants. More or less parallel results were obtained with both guinea pigs and cattle. The 3 types of virus did not afford protection against each other, and animals could be infected as many times within a brief period. This is in support of the conclusion of Vallée and Carré, previously noted (E. S. R., 47, p. 680).

The tenacity of the foot-and-mouth disease virus [trans. title], K. Trautwein (*Arch. Wiss. u. Prakt. Tierheilk., 54 (1926), No. 4, pp. 273–279*).—Tests made by the author of the vitality of the foot-and-mouth disease virus in lymph are reported upon following a review of the literature. The lymph from lesions in pigs, which became dry on various materials, including sand, manure, etc., remained infective for periods ranging from 5 to 11 days. Epi-

thelial shreds retained their virulence for much longer periods even when exposed to sunlight. Fragments of epithelium placed in dung in water or exposed to the air in the open remained virulent for periods up to 67 days. Heating to 60° C. (140° F.) in a water bath proved fatal to the virus within 5 minutes. The virus in shreds of epithelium buried in dung at a depth of 30 cm. (12 in.) lost its virulence within 6 days.

Infectious abortion in cattle (*Georgia Sta. Rpt. 1926, pp. 135–138*).—In referring to eradication work with infectious abortion of cattle it is stated that it has been found practically possible through the application of sanitation practices and quarantine to eradicate the disease from a badly infected herd of dairy cattle without the expense of selling the reactors. Through the use of the agglutination test a herd that was originally infected to the extent of 70 per cent has been entirely rid of the disease in less than two years' time.

Reference is next made to chemotherapy studies in which acriflavine was first tested. In referring to this work, a more detailed account of which by Edwards and Coffman has been noted (E. S. R., 56, p. 278), it is pointed out that while this compound has given the best results of those tried the work is still in the experimental stage. In tests made of the disodium salt of dibromoxymercurifluorescein, commercially known as mercurochrome 220, administered intravenously, the results were not so favorable as those with acriflavine. There appears to be evidence that the compound destroys the organism, but it seems to have an undesirable toxic action upon the animals treated.

Preliminary report of experimental work in the control of bovine infectious abortion, C. P. Fitch, W. L. Boyd, and R. E. Lubbehusen (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 3, pp. 362–369*).—This is a contribution from the Minnesota Experiment Station.

The authors report that their experimental work during the past 6 years with immunizing agents for the control of bovine infectious abortion indicates that bacterins, vaccines, and serums will not reduce the losses from this disease to a desirable minimum. Experimental work conducted with the view to obtaining a clean herd, through use of the blood test, was commenced in December, 1923, with two experimental herds, one infected and one not infected. They were kept in two barns, separated by not more than 75 ft., and tended by the same men. The results obtained, the details of which are given in tabular form, seem to indicate that it is feasible for a breeder to maintain a clean and an infected herd under such conditions.

Control of abortion disease by blood testing and segregation, I. E. Newsom and F. Cross (*Colorado Sta. Bul. 317 (1927), pp. 30, figs. 5*).—Following a brief review of the literature the authors report upon work conducted. Records of agglutination tests of the college beef and dairy herds, individual histories of reacting animals, and the breeding records are reported in tabular and chart form.

The elimination of abortion disease by the agglutination test and segregation in the college beef and dairy herds is described. In the beef herd it took 5 tests and 10.5 months to eliminate the disease, 16, or 43 per cent, of the original 37 animals being removed as reactors. All 5 aborting animals became positive to the test, but 2 reacted only after aborting. Reactors were segregated only until sold or until they calved. It cost $1,478.08 in depreciation of value of animals to dispose of the 16 reactors in the beef herd, or an average of $92.38 per head. In the dairy herd it took 8 tests over a period of 18.5 months to remove all the reactors, 15 of the original 34, or 44 per cent, being eliminated. Of the 12 aborting animals, 7 became reactors and 5 were constantly negative. One of the aborters became positive only after the premature delivery of the

calf. It cost $1,058.23 in depreciation of value to dispose of the 15 reactors in the dairy herd, an average of $70.55 per head.

The breeding records of both herds for the past 10 years, which are included, shows that during the earlier years, at least, sterility and abortion did not run parallel, and in the case of the dairy herd the sterility was high even when the reactor curve was low. During the second or last 5-year period the sterility and abortion curves showed a close relationship.

Genital infection in mares by an organism of the Encapsulatus group, W. W. Dimock and P. R. Edwards (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 4, pp. 469–480*).—In this contribution from the Kentucky Experiment Station the authors deal with *Encapsulatus genitalium*, which was recovered and identified in the case of metritis previously noted (E. S. R., 54, p. 378). Cultures were made from the cervix and uterus of 1,424 mares, the organism *E. genitalium* having been recovered from 62, or 4.4 per cent, of the total number cultured. In the present paper the authors consider the clinical pathology, gross pathology, metritis, salpingitis, uterine alterations, cultural characteristics, cultures unusually uniform, and cross-agglutination tests, and present reports of 6 cases.

Poultry diseases, including diseases of other domesticated birds, with a chapter on the anatomy of the fowl, B. F. Kaupp (*Chicago: Alexander Eger, 1927, 4. ed., rev. and enl., pp. 393, figs. 158*).—This is a fourth enlarged and revised edition of the work previously noted (E. S. R., 48, p. 183).

[Poultry disease investigations at the North Carolina Station], B. F. Kaupp and R. S. Dearstyne (*North Carolina Sta. Rpt. 1926, pp. 71, 72–74, 76, 77, figs. 3*).—A laboratory study was made of 54 cases of respiratory disease, all the observations indicating that the cases of roup were focal infections that did not produce toxemia of sufficient severity to upset body metabolism. The greatest injury is due to the accumulation of an inflammatory product thrown out on the respiratory mucous surfaces, thus obstructing the respiratory passages and also impairing vision by its infection of the eyes. The disease was contracted by actual contact of normal birds with those diseased. A complete blood study of 43 cases, representing all stages of the disease, indicated that it produces a stimulation of the production of red blood cells with a relative increase in the varieties of leucocytes.

Studies of the germ content of the air of poultry houses reveal an excessively bacteria-laden atmosphere.

In the investigations under way evidence was obtained that a bacteriophage may accompany outbreaks of fowl typhoid.

A study of coccidiosis shows that there are two stages in the chick's growth when it is peculiarly susceptible to the coccidia infection, namely, (1) from 10 to 20 days of age, or as brooder chicks, and (2) from 5 to 7 weeks of age in the range period when growing the large wing and tail feathers.

A study of bacillary white diarrhea under southern conditions was made, using 25 Single Comb Rhode Island Red and 25 Single Comb White Leghorn hens which had reacted in field testing and certification work. During the first 10 months these reacting hens laid 3,899 eggs in trap nests, all of which were cultured. *Salmonella pullorum* was isolated from 225, or 5 per cent, of the eggs, and there were in addition 258, or 6 per cent, infected by other bacteria.

The effect of refrigeration of serum on its agglutination properties was tested over a period of 7 months and 6 days. The serum taken from reacting Rhode Island Red hens was kept frozen from December 14, 1925, to July 20, 1926. The tests were run in dilutions of 1:25, 1:50, 1:100, and 1:200 and show that the serum retained fully its power of agglutination.

Trap nest records kept of the hens show continuous interruptions in the egg-laying cycles as a result of the focal infection, it being evident that heavily infected birds are uneconomical. Physical studies indicate that there is no marked difference in body function as to respiration, temperature, and ability to digest feed. The blood remains about normal, and there are no outside indications that infected birds are such. Monthly blood tests with 4 antigens are said to have shown that the test is consistently the same. A distinct cross agglutination with an antigen for avian typhoid was demonstrated.

Acute infection of chicks and chronic infection of the ovaries of hens caused by the fowl-typhoid organism, J. R. BEACH and D. E. DAVIS (*Hilgardia [Calif. Sta.], 2 (1927), No. 12, pp. 411-424*).—The authors here report upon investigations conducted during the course of an outbreak in 1924 among 145 baby chicks obtained from a commercial hatchery. The mortality during the first 45 days of the lives of these chicks and which commenced when they were about 60 hours old was 54.4 per cent, *Bacterium sanguinarium* being isolated from 72.1 per cent of those that died. Of the deaths from fowl typhoid infection, 85.9 per cent occurred during the first 2 weeks. Failure to recover the organism was encountered in only 3 of the 52 chicks that died during this period, while of the 27 chicks which died after the second week *B. sanguinarium* was recovered from 29.6 per cent. Abnormalities of the liver were found in 98 per cent of the 52 which died during the first 2 weeks and 22.2 per cent of those which succumbed later, while unabsorbed yolk was present in 80.7 and 18.5 per cent, respectively. It is pointed out that this outbreak of disease due to *B. sanguinarium* resembled in all respects bacillary white diarrhea due to *B. pullorum*.

Observations were made of 25 of the 66 survivors, including 20 females and 5 males, kept for 1 year, no evidence being obtained that such chicks became chronic carriers of *B. sanguinarium*.

A portion (196) of the flock of 1,300 hens which produced the eggs from which the chicks were hatched were tested, and positive reactions were obtained with 32 hens. Partial or complete agglutination with antigens from both *B. pullorum* and *B. sanguinarium* was obtained from 29 of the 32 samples tested. The results of the agglutination test indicated that the reacting birds were infected either with both *B. pullorum* and *B. sanguinarium* or with one of the two species alone, but did not make it possible to arrive at a more definite conclusion. The studies are considered to furnish evidence that *B. sanguinarium* like *B. pullorum* is transmitted directly to chicks through eggs laid by infected adults. It is pointed out that the cross-agglutination makes it possible to detect carriers of either *B. sanguinarium* or *B. pullorum* by an agglutination test employing *B. pullorum* antigen, and that this enhances rather than detracts from the value of the agglutination test. The details of the agglutination tests and the results of post-mortem examinations of the reacting hens are reported in tabular form.

Wattle disease of fowls in Victoria, A. W. TURNER (*Jour. Aust. Vet. Assoc., 2 (1926), No. 4, pp. 127-129*).—An account of a disease that is associated with a local infection by a Pasteurella organism. In the cases investigated this organism differed from the organism of fowl cholera in that it was avirulent when subcutaneously injected. It differed from a similar organism described by Seddon in 1914 (E. S. R., 30, p. 785; 31, p. 782) in that it will not cause fowl cholera.

Vaccination for diphthero-variola of the pigeon [trans. title], J. LAHAYE (*Ann. Méd. Vét., 71 (1926), No. 10, pp. 401-415*).—Work with the several methods of vaccination is reported by the author.

Teniacidal value of certain drugs for chickens, B. A. BEACH and D. M. WARREN (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 4, pp. 498–505*).—This is a contribution from the Wisconsin Experiment Station, in which the results of treatment of chicks with kamala are reported in tabular form. The results of work with arecolinehydrobromide, Lewis's concentrated lye, and eserine sulfate and pilocarpine hydrochloride follow.

While the lye was successful in removing tapeworms, it was very irritating to the mucous membrane of the proventriculus and duodenum and so toxic that death followed its administration in the three birds fed. Arecolinehydrobromide not only failed to remove the tapeworms from the birds, but was very toxic. Eserine and pilocarpine gave unsatisfactory results similar to those obtained by feeding arecolinehydrobromide.

Kamala gave by far the most promising results, the findings being similar to those obtained by Hall and Shillinger (E. S. R., 55, p. 178) and demonstrating that kamala in 1-gm. doses is an efficient teniacide. Tapeworm segments were found in the feces after feeding in 22 of the 46 cases, 45 of which failed to demonstrate tapeworms on post-mortem examination. In 23 cases no tapeworms were found either in the feces or on post-mortem.

Miscellaneous anthelmintic investigations, M. C. HALL and M. WIGDOR (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 2, pp. 195–217*).—In the investigations here reported the authors have found the latex of the fig, *Ficus laurifolia*, after shipment to the United States, to be a satisfactory anthelmintic, but they point out that this affords no evidence as to its value in the countries where the tree grows. Pyrethrum does not appear to be of value as an anthelmintic. Betanaphthol is apparently distinctly inferior to carbon tetrachloride and tetrachlorethylene for removing hookworms from dogs. Carbon disulfide does not appear to be of value as an anthelmintic for dogs. One test of chloretone does not show that it has anthelmintic value, but the authors point out that there are theoretical reasons why it should receive further test in connection with the supposedly anthelmintic value of chlorine in hydrocarbon compounds. Fowler's solution appears to have a very slight anthelmintic value, which develops very slowly, and it can not be recommended as an anthelmintic. Barium sulfate seems to have no anthelmintic value. Mineral oil in repeated doses has little or no value in removing worms. The cresols have very slight anthelmintic action in most cases, and act as gastrointestinal irritants to such an extent that their use is not safe.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the California Station] (*California Sta. Rpt. 1926, pp. 34–37*).—A. H. Hoffman reports that air cleaners of the radiator fan type have been found to be low in efficiency as a class, and in addition have the serious handicap of having to be of necessity where the dust concentration is high.

Studies by E. J. Stirniman of equipment for handling grain in bulk and in sack, which included 37 combine harvesters harvesting 44,892 acres of wheat and barley, showed that the rate of harvesting per foot of width was the greatest for the largest combines. Combine labor cost per acre for sacked grain was $1.57 and for bulked grain 58 cts.

Experiments by Stirniman on equipment and methods for removing stumps showed a cost of clearing land of 6- to 18- in. oak stumps with the barrel type stove considerably lower than by the pulling process. Green or wet stumps

opened with a light powder blast in the winter or spring burned readily the following fall. Dry softwood stumps burned to a depth of from 4 to 8 ft. below the ground level. Green or wet stumps did not burn below tillage depth.

In a study of walnut dehydrators the thermal efficiencies of gas heated plants varied from 11.9 to 34.3 per cent, of oil heated plants from 9.8 to 34 per cent, and of electric heated plants from 28.1 to 56.8 per cent. The costs for electrically heated plants, including operation, interest, and depreciation, were favorably comparable with those for the other plants.

[Irrigation investigations at the California Station] (*California Sta. Rpt. 1926, pp. 72–75*).—In investigations of irrigation requirements in the Sacramento Valley it has been found by M. R. Huberty that as a general rule a considerable quantity of water is lost by deep percolation in areas served by cheap gravity water. Contour irrigation is deemed by Huberty, Davis, and Brown the best method to use when straight furrow irrigation causes washing and when the soil is shallow and irregular. Where properly followed, this method has been found to increase the penetration of irrigation water and to conserve and control storm water. It was further found by S. H. Beckett, H. F. Blaney, and C. A. Taylor that in regions of light annual rainfall properly organized field soil moisture studies will give a true measure of consumptive moisture use.

[Irrigation investigations at the New Mexico Station] (*New Mexico Sta. Rpt. 1926, pp. 19–24*).—The progress results of investigations conducted in cooperation with the U. S. D. A. Bureau of Public Roads relating to ground water movement, duty of water, and water requirements of crops are briefly reported, and some of the more important data are tabulated, particularly on duty of water.

Electricity on New England farms, W. T. Ackerman (*New Hampshire Sta. Bul. 228 (1927), pp. 47, figs. 10*).—This is a progress report for the years 1925–1926 of the station project on the relation of electricity to agriculture. It presents the results of experiments on the use of both major and minor electrical equipment on seven farms in New Hampshire, representing dairy, poultry, fruit, and general farming.

Current consumption on the seven farms averaged 1,683 kw. hours for the year 1925 and increased to 4,253 kw. hours in 1926. Heating and similar equipment, such as refrigerators, ranges, ironers, water heaters, etc., produced the greatest effect on the total consumption and developed a peak load in midsummer. The total consumption for the year 1926 was distributed as follows: Winter 23 per cent, spring 16, summer 32, and fall 28 per cent. The total consumption by farms for 1926 ranged from 432 kw. hours for the fruit farm to 7,694 kw. hours for one of the dairy farms.

House lights showed an average monthly consumption of 34.6 kw. hours ranging from 15.2 to 63.3; water pumps 23.7 kw. hours, ranging from 3.7 to 39; and kitchen ranges 167 kw. hours, ranging from 26 to 282. House refrigerators used an average of 35.8 kw. hours per month, ranging from 23 to 39.5; and hot water heaters 182 kw. hours, ranging from 15.2 to 548. The latter have given a high degree of service, but their cost of operation has been high. Washing machines used an average of 2.6 kw. hours per month, flatirons 7.3, and ironing machines 12.7 kw. hours. Barn lights used an average of 7.9 kw. hours per month, ranging from 4.3 to 13.9; and milking machines 91.5 kw. hours, ranging from 56.5 to 134. Dairy cooling rooms showed an average monthly consumption of 119 kw. hours, ranging from 96.5 to 148.

RURAL ECONOMICS AND SOCIOLOGY

[Agricultural economics investigations at the New Mexico Stati 1926] (*New Mexico Sta. Rpt. 1926, pp. 57–61*).—Results are reported follows:

The economics of range cattle production in New Mexico.—Returns for 19 from 112 strictly cattle ranches of 127 ranches studied in cooperation with t Bureau of Agricultural Economics and the Bureau of Animal Industry, U. D. A., showed the returns on investment to be 15.44 per cent, of which all b 0.02 per cent arose from the increase in market values of stock held. T highest percentage of return was made on ranches with from 301 to 500 bre ing cows. The average investment was $61 per animal unit. The average c of producing branded calves was $30.80, the cost increasing as the size of t ranch increased. Indebtedness amounted to 39 per cent of the investme Money on land cost 6.5 per cent and on cattle 8.1 per cent.

The present status of the El Paso and adjacent territory egg market.—Ka sas, Nebraska, Oklahoma, and Texas supply 86 per cent of the market deman Imported eggs sell for an average of 34 cts. per dozen, while those produc locally average 47 cts. per dozen to the producer. Increased production in Ne Mexico is warranted, provided the producers can compete with the cheaper eg of good quality supplied by Kansas and Nebraska.

Fruit and vegetable market studies.—All of the New Mexico lettuce moves eastern markets, 85 per cent of the shipments in 1925 being made before Octob 10, and consequently meets some competition from California, Colorado, a Idaho. The apple crop in 1925 constituted about 1 per cent of the marketab crop of the United States. The bulk of the shipments were made between Se tember 1 and November 1, 97 per cent going to Texas points.

Man labor, horse work, and materials used in producing crops i Christian County, J. B. HUTSON and W. G. FINN (*Kentucky Sta. Bul. 27 (1926), pp. 379–434, figs. 4*).—This bulletin is based on records obtained by th detailed route method from 10 to 14 Christian County farms for the year 1921–1923. The following table gives the man labor and horse work used b acres and crop yields on the chief crops:

Man labor and horse work used on different crops, 1921–1923

Crop	Hours per acre			Hours per unit of production			
	Lowest	Highest	Average	Unit	Lowest	Highest	Average
MAN LABOR							
Tobacco	201.2	352.4	282.9	1,000 pounds	279.5	421.7	335.
Corn	20.0	33.6	23.6	40 bushels	20.1	58.8	26.
Wheat	7.8	15.5	11.0	12 bushels	8.9	20.9	13.
Mixed hay	7.5	13.7	10.2	1 ton	7.9	17.7	11.
HORSE WORK							
Tobacco	63.7	125.2	82.7	1,000 pounds	[1] 71.5	[1] 161.6	105.
Corn	[1] 26.4	55.2	37.9	40 bushels	[1] 27.1	94.7	42.
Wheat	[1] 14.1	33.8	22.5	12 bushels	[1] 16.7	42.6	25.
Mixed hay	7.1	16.8	11.1	1 ton	6.5	18.7	12.

[1] Includes tractor work.

Tables are given showing the usual dates of different operations, crew and quipment, hours per acre of man labor and horse work, and cost of materials equired for the several crops.

A study of dairy farm organization in southeastern Minnesota, G. A. OND (*Minnesota Sta. Tech. Bul. 44 (1926), pp. 94+[14], figs. 25*).—The results re given of a detailed study in cooperation with the U. S. D. A. Bureau of gricultural Economics of 38 representative dairy farms in Steele County dur- ng a 5-year period, beginning January 1, 1920. Records kept with the help nd under the supervision of a route man were obtained from 12 farms for year, 5 farms for 2 years, 5 farms for 3 years, 6 farms for 4 years, and 10 rms for 5 years. The farms averaged 186 acres, of which 47 acres were in asture and 129 acres in crops. Of the crop acreage 32.7 per cent was in corn, 3.4 in oats, 22.3 in hay and alfalfa, 10.5 in barley, and 5.7 per cent in wheat. or each 100 acres of land there were 9 milch cows, 9.8 other cattle, 23.4 vine, 79.4 poultry, 0.8 sheep, 3.6 work horses, and 0.6 colts. The farms re- ived 52 per cent of their income from the sale of dairy products and cattle,) per cent from swine, 6 from other livestock, 11 from crops, and 2 per cent om miscellaneous sources.

Tables are given showing for the several farms in 1924 the amounts of feeds f different kinds, man labor, horse work, and veterinary services and medi- ne used per dairy cow, per young dairy cattle, per 100 chickens, per work horse, nd per colt, and to produce 100 lbs. of pork in 1923. The milk and butterfat roduction per cow in 1924 is also included. Averages for all farms for each ar studied are also included. Charts showing the man labor distribution by eeks for the year, and standards for feeds, man labor, horse work, and cash st for the different kinds of stock are given. The variations in the different ctors between different farms are discussed.

The usual practices in producing different crops are described and tables en for each crop showing the standard man labor and horse work require- nts and the distribution of labor. Tables are appended showing by farms in 22 the man labor and horse and tractor work required for different operations raising and harvesting the different crops, and the averages for all farms for h of the other years.

Illustrations are presented of the method of using the data in the bulletin in nning reorganization of farms.

Cost of producing almonds in California.—A progress report, R. L. AMS (*California Sta. Bul. 422 (1927), pp. 52, figs. 4*).—This progress report ers the results obtained for the first season studied (1925) and is based n 149 farms covering 4,577.89 acres of pecan orchards in 13 areas. The duction varied from 15 to 1,824 lbs. per acre, averaging 418 lbs., and the cost pound varied from 3.9 cts. to $1.79, averaging 11.15 cts., exclusive of the rges for management, use of operating capital, depreciation of trees, and erest on investment in orchard. The average cost per acre for the different ns are soil care $10.27; tree care $6.01; irrigation $4.17; harvesting, hulling, l delivering $18.94; taxes $3.55; use of equipment $3.48; and office expense cts., totaling $46.60.

Tables are given showing for the farms in the several areas the number of es, yield, costs of different items, age, variety, and size of trees, and approxi- te percentage of stand.

The cost of farm real estate maintenance, F. L. Morison (*Ohio Sta. Bimo. l., 12 (1927), No. 2, pp. 60, 61*).—Cost records from 81 farm owners with ms averaging 180 acres for the period 1920–1924 show that the average nual net cost for real estate maintenance was $5 per acre, of which repairs

and depreciation on buildings constituted 41 per cent, real estate taxes 33, upkeep of fences 11, drainage 9, insurance 2, and miscellaneous expenses 4 per cent.

Tax burdens compared, B. H. Hibbard and B. W. Allin (*Wisconsin Sta. Bul. 393 (1927), pp. 26, figs. 10*).—This study was made to determine how the increased tax burdens from 1913 to 1924 fell relatively upon the farm, city, and village classes. Real estate and personal property taxes, State and Federal income taxes, and State income surtaxes are included, but not corporation incomes and taxes. Dane County was taken as a representative county, and the reports of incomes received and taxes paid were divided into three groups, as follows: (1) Individuals filing reports for 1924, including 4,214 farmers, 13,000 city people, and 1,854 villagers; (2) individuals filing for the years 1918, 1919, 1923, and 1924, 1,818 farmers, 3,224 city people, and 362 villagers; and (3) individuals filing for the years 1913, 1914, 1918, 1919, 1923, and 1924, 214 farmers, 1,353 city people, and 133 villagers.

The following table shows the percentages of income paid by each class of each group:

Percentages of income paid by farm, city, and village people

Group	Class	1913	1914	1918	1919	1923	1924
I	Farm						19.0
	City						6.5
	Village						5.9
II	Farm			5.3	7.2	17.4	20.5
	City			5.3	5.9	7.9	7.7
	Village			3.7	4.0	6.4	6.9
III	Farm	12.3	13.9	6.7	9.0	19.1	22.5
	City	4.8	4.9	7.2	7.8	9.5	8.9
	Village	4.9	5.0	4.6	4.8	8.0	8.2

From 1913 to 1924 farm and city incomes increased 15 and 118 per cent, respectively, while taxes increased 138 and 326 per cent, respectively.

Tables and charts are included showing for each class in group 1 the number and percentage having incomes of different amounts and the average net income of each income class; and for groups 2 and 3 the percentages of net income absorbed by taxes, the average taxes, and the average incomes.

The causes of the heavy farm tax burden are discussed.

Report of the Imperial Economic Committee on marketing and preparing for market of foodstuffs, I–IV, H. J. Mackinder et al. (*London: Imp. Econ. Com., Rpts. 1 (1925), pp. 38; 2 (1925), pp. 35; 3 (1926), pp. 274, pls. 3; 4 (1926), pp. 147, pls. 7*).—These reports were presented to Parliament by the committee acting under terms of reference published March 6, 1925, "to consider the possibility of improving the methods of preparing for market and marketing within the United Kingdom the food products of the overseas parts of the Empire with a view to increasing the consumption of such products in the United Kingdom in preference to imports from foreign countries, and to promote the interests both of producers and consumers."

First Report: General.—The work of the committee is described and its conclusions set forth under the heads of identification of Empire produce, research, and finance. Recommendations are made that the present legislation regarding the identification of and publicity for Empire products be enforced and supplemented by further legislation; that an annual grant be made by the British Parliament to be used for education, publicity, and research in the production and preservation of foodstuffs; and that the expenditures of the grant

be under the supervision of a commission and about 65 per cent of the amount be allocated to the promotion of trade in Empire produce, about 15 per cent to research, and the balance reserved for the promotion of fruit growing in the tropical parts of the Empire, the carriage of pedigree stock from the United Kingdom to the overseas parts of the Empire, and similar schemes.

Second Report: Meat.—Statistics are given and discussed regarding the production and supplies of the United Kingdom and the overseas parts of the Empire, consumption, and market requirements of the United Kingdom, and the imports into the United Kingdom from the overseas parts of the Empire and competing foreign countries of beef, mutton, lamb, pig products, and canned meat and fish. Conditions affecting trade with the overseas parts of the Empire and with competing countries are discussed. It is recommended that imported meat and canned goods be marked to disclose country of source; that a study be made of the possibilities of more rapid transportation; that the Government defray the cost of transporting pedigree breeding cattle, sheep, and hogs to other parts of the Empire; that restrictions on the importation of live cattle, except those to prevent introduction of disease, be reconsidered; and that the requirements of the United Kingdom be studied and products standardized.

Third Report: Fruit.—This report consists of a general report (pp. 9-80) and appended reports (pp. 81-274) on apples, citrus fruit, other fruit and fruit products, and nuts. The position of fruit in the inter-Imperial trade; the dependence of the United Kingdom on foreign fruit supplies; the present marketing system, including financing, distribution, and analysis of costs; the present *organization among producers and the necessity for further organization; the* need for organization of consumers; publicity, advertising, and identification of produce; and the need for certain lines of research are discussed. The imports of fruit into the United Kingdom during the past 20 years have increased nearly three times the rate of increase for imports of breadstuffs and nearly twice the rate of the imports of meat, yet the consumption per head is still much smaller than in the United States.

Less than 25 per cent of the fruit imports are from the overseas parts of the Empire, although the committee estimates that the greater part of the fruit imports, except grapes and oranges for winter consumption, could in the near future be furnished from British sources. The committee's recommendation is that a voluntary preference for Empire produce be developed among United Kingdom consumers by the organization of the producer and the mobilization of the consumer.

Fourth Report: Dairy produce.—The home production, consumption, and sources of supply of dairy products of the United Kingdom; the dairy industries in the several overseas parts of the Empire; the manufacture, transporting, and marketing of dairy products; and the need of research are discussed. Only 17 per cent of the butter and 31 per cent of the cheese consumed in the United Kingdom are produced within it, and only 52 per cent of the imports by value in 1924 came from the overseas parts of the Empire. Although consumption is increasing, the committee believes that competition from Argentina, Siberia, Russia, and the Baltic countries will become more severe. Increased production by better methods, better seasonal distribution of supplies, winter dairying, and more rapid adjustment of retail prices to available supplies are among the recommendations made. A supplementary report on margarine included discusses the production and consumption in the United Kingdom, the United States, and other countries; the Empire as a producer of the raw materials; and the possible future development of the industry.

Extent and causes of rejections of boxed apples from the State of Washington, seasons 1922 to 1925, R. R. PAILTHORP and J. W. PARK (*U. S. Dept. Agr., Dept. Circ. 413 (1927), pp. 16, figs. 8*).—This report is based upon the records of sales of 30,245 cars shipped during the seasons 1922–23 to 1924–25, inclusive, being from 38.1 to 46.4 per cent of the total yearly shipments for the State, and averaging 42.8 per cent. From 72.5 to 86.9 per cent, or an average of 81.5 per cent, of the yearly shipments were made f. o. b. usual terms, and these shipments are the only ones considered in this study.

Price reductions were made on from 6 to 15.2 per cent of the f. o. b. usual term shipments, averaging 10 per cent. The reductions in terms of the f. o. b. price of rejected cars were 26.4 per cent in 1922–23, 19.2 per cent in 1923–24, and 13.1 per cent in 1924–25. Of the cars on which price reductions occurred, allowances to original buyers were made on 56 per cent, 60 per cent, and 75 per cent in the respective years, these allowances averaging 18 per cent, 13.1 per cent, and 10.9 per cent of the invoice price. In the case of rejected cars resold, the reductions amounted to 36.5, 28.3, and 19.7 per cent of the invoice price for the respective years. Less than 5 per cent of the rejected cars for the period were resold at the original invoice price or more, the average advance being only about 3 per cent. Buyers' reasons for making rejections or requesting allowances in the respective years were as follows: Condition 79.1, 42.9, and 68.8 per cent; grade 12.6, 20.4, and 10.9 per cent; disputes concerning specifications 2.3, 21.2, and 15.4 per cent; and railroad service, miscellaneous, and undetermined 6, 15.5, and 4.9 per cent.

The correlation between price changes and the number of rejections was not pronounced. The percentage of rejections showed some tendency to increase as the season progressed, probably due to deterioration of the fruit.

Suggestions made to improve conditions are written confirmation of sales on a standard form, complete specifications in sale contracts, inclusion of information essential to a valid contract in correspondence during negotiations, use of the Government inspection service at the shipping point, and improvements in the methods of handling and storing apples.

Cooperative sales organization for livestock, T. MACKLIN and M. A. SCHAARS (*Wisconsin Sta. Bul. 394 (1927), pp. 44, figs. 9*).—The six cooperative sales agencies on the Milwaukee, Chicago, and St. Paul markets sell about 15 per cent of the total market receipts. The history, organisation, management, and business of these associations are described. The financial and service results of such organizations and the factors to be considered in choosing a market are discussed and suggestions made as to how to build up a cooperative marketing program.

Results of a questionnaire sent to shipping associations in Wisconsin showed that 72 of the 125 reporting were members of cooperative sales agencies, and of this number 47 shipped all of their stock to their cooperative sales agents, 14 shipped one-half or more, 9 shipped less than one-half, and 2 shipped nothing to their agents.

Crops and Markets [April–May, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), Nos. 4, pp. 121–160, figs. 5; 5, pp. 161–192, figs. 3*).—The usual tables, charts, summaries, etc., are included for cotton and other crops, dairy products, livestock and livestock products, feedstuffs, fruits and vegetables, hay, prices, etc. No. 4 includes tables and text summarizing the replies received from over 7,000 breeders to a questionnaire as to the sale prices of purebred cattle, hogs, and sheep. No. 5 includes a table showing by divisions of the United States the changes in the agricultural population due to births, deaths, and moving to or from cities, towns, and villages.

Maine agriculture: A statistical presentation, C. H. MERCHANT (*Maine Sta. Bul. 338 (1927), pp. 19–148, figs. 24*).—A tabular and graphic presentation by counties and towns showing the number and size of farms, use of land, and value of land, buildings, and machinery in 1925; livestock on farms, January 1, 1925; livestock products in 1924; acreage and production of principal crops in 1924; kind of roads, January 1, 1925; value of farm products sold and supplies purchased in 1924 through cooperative organizations; mortgage debt, 1925; farm expenditures, 1924; tractors and radios on farms, 1925; and other miscellaneous data.

The green rising, W. B. BIZZELL (*New York: Macmillan Co., 1926, pp. [XI]+269*).—A brief historical survey of agrarianism in the United States, Europe, and Mexico is made. The influence of the Colonial and Federal land policies and the tariff on agrarianism in the United States, the organized efforts of farmers for political action and to improve their economic and social status, and the results of such efforts are described.

Rural Scotland during the war, D. T. JONES ET AL. (*London: Humphrey Milford, Oxford Univ. Press; New Haven: Yale Univ. Press, 1926, pp. XVI+311, pl. 1, figs. 16*).—This publication of the Carnegie Endowment for International Peace includes 3 monographs with an appendix on agriculture and one on Scottish fisheries during the war, by D. T. Jones (pp. 23–119).

Scottish agriculture, with special reference to food production, H. M. Conacher (pp. 121–186).—This discusses the physical conditions of the country, the economics of Scottish agriculture with special reference to the conditions created by the war, imports and exports of agricultural products before and during the war, rises in the wages of farm workers, sheep and dairy farming under controlled conditions during the war, maintenance of livestock and the rationing of meat, increased food production during the war, and the permanent effects of the war on agriculture.

The Scottish agricultural labourer, J. F. Duncan (pp. 187–220).—This describes the organization of farm labor and conditions before the war, and the earnings, hours, and social conditions, 1914–1922.

Scottish land settlement, W. R. Scott (pp. 221–264).—This discusses the land problems; land settlement, 1912–1918; and the settlement of ex-service men since the war.

The jute industry in Scotland during the war, J. P. Day (pp. 265–307).—This describes the origin and development of the industry, and the conditions during and since the war.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A survey of the public educational system of Porto Rico (*Columbia Univ., Teachers Col., Internatl. Inst. Studies No. 8 (1926), pp. X+453, pls. 12, figs. [42]*).—This survey, made under the direction of the International Institute of Teachers College, Columbia University, includes descriptions and discussions of the work being done in agriculture and home economics education.

Brief biology, C. GRAMET (*New York: Globe Book Co., 1926, rev. ed., pp. V+218, figs. 36*).—A revision made in collaboration with J. F. Hummer of a text covering the essentials of elementary biology. Experiments and questions are included for each chapter.

The elements of general zoology, W. J. DAKIN (*London: Humphrey Milford, Oxford Univ. Press, 1927, pp. XVI+496, figs. 258*).—An elementary text on animal biology. The function of the structures is treated in interrelation with the study of the structures.

Laboratory outlines in general zoology, G. C. HAWK (*Ann Arbor, Mich.: Edwards Bros., 1926, pp. [2]+46*).—A mimeographed outline of 14 laboratory studies planned to cover 144 hours of laboratory work, including 12 hours of field work.

Farm projects and problems, K. C. DAVIS (*Philadelphia and London: J. B. Lippincott Co., 1927, pp. [XI]+539, pl. 1, figs. 217*).—An elementary text for rural schools and the sixth, seventh, and eighth grades of graded village and city schools. The job analysis plan of teaching is followed. Twenty-four enterprises are considered. The jobs under each enterprise are arranged in the order in which the farm project is pursued. The season for teaching and the time to be devoted are suggested, and the conditions usually found, aims, and topics for assignment and home study are outlined.

Horticulture, K. C. DAVIS (*Philadelphia and London: J. B. Lippincott Co., 1927, 4. ed., enl., pp. VII+XXXIIa+416, pl. 1, figs. 287*).—An enlarged edition of the text previously noted (E. S. R., 41, p. 597).

Forest fire prevention handbook for school children (*U. S. Dept. Agr., Misc. Circ. 79 (1926), pp. II+30, figs. 30*).—This circular, prepared by the Forest Service in cooperation with the State forester and the superintendent of public instruction of California, describes the forests of that State, and contains a lesson each on causes of fires, effects of fires, fire prevention, and how forest fires are detected and fought.

Food study manual, A. KENNEDY (*Peoria, Ill.: Manual Arts Press, 1927, pp. 76, figs. 5*).—A manual for junior high school classes in foods and home making.

Elementary home economics (*Manila, P. I.: Bur. Ed., 1925, pp. 326, pl. 1, figs. 32*).—This textbook, prepared for use in the intermediate schools of the Philippine Islands, is a rearranged and slightly revised edition of that previously noted (E. S. R., 43, p. 798), with a seventh-grade text on food selection and diet and home nursing, prepared by the Philippine Bureau of Education, incorporated.

Home economics education in Porto Rico, E. M. WILLSEY (*Porto Rico Dept. Ed. Bul. 4 (1926), pp. 81, fig. 1*).—This bulletin gives supervisors and principals suggestions for the organization and supervision of the work in home economics, outlines courses, and offers ideas and explanations intended to bring about uniformity in the work. Elementary school, high school, and vocational home economics are covered.

Syllabus on Tennessee, economic and social, C. E. ALLRED (*Tenn. Univ. Rec., Ext. Ser., 4 (1927), No. 1, pp. XII+66*).—A syllabus for a high school course in the applied economics and sociology of Tennessee and the student's home county. Physical and climatological features, wealth, natural resources, population, agriculture and other industries, transportation facilities, taxation, health and sanitation, education, libraries, churches, recreational facilities, and other subjects are considered.

Extension projects in rural community organization, C. H. SCHOPMEYER (*U. S. Dept. Agr., Ext. Serv. Circ. 43 (1927), pp. 36, figs. 2*).—A mimeographed paper reviewing the present status of the work in the different States and summarizing in general terms the work being done along different lines.

FOODS—HUMAN NUTRITION

Public health aspects of food preservation, C. R. FELLERS (*Amer. Jour. Pub. Health, 17 (1927), No. 5, pp. 470–475*).—In this summary of the public health problems involved in the preservation of foods, the necessity is emphasized of using fresh, clean, raw products and sterilized receptacles for any

method of preservation and of maintaining proper sanitation in the factory. The dangers of incomplete sterilization are considered to be increased by the failure to revise many popular bulletins and circulars on canning containing erroneous statements and faulty methods. In this connection favorable comment is made on Farmers' Bulletin 1471 (E. S. R., 55, p. 189). The prevailing idea that canned food must be removed from the container immediately upon opening is thought to be without foundation. "Adulteration of canned, dried, or smoked food is at present of minor significance from a public health standpoint. This is due largely to excellent law enforcement by the several Federal and State food officials. Dried foods and cold-stored foods likewise present few public-health problems."

A list of 25 references to the literature is appended.

Home-cured pork, E. J. Wilford (*Kentucky Sta. Bul. 273 (1926), pp. 345–377, figs. 24*).—Practical directions are given for slaughtering hogs on the farm, dressing and cutting up the carcass, curing the meat, and preparing various pork products. An appendix contains the dressing percentages of hogs of various weights and a note on the habits of skipper flies, with directions for preventing the meat from being infested with them.

Practical physiological chemistry, P. B. Hawk and O. Bergeim (*Philadelphia: P. Blakiston's Son & Co., 1926, 9. ed., rev. and enl., pp. XVIII+931, pls. 8, figs. 273*).—In the revision of this well-known laboratory manual, earlier editions of which have been noted (E. S. R., 46, p. 859), important additions have been made in the quantitative methods of biochemical and clinical procedure, particularly in the section on metabolism studies. In this the latest accepted methods for the determination of the various vitamins are included, with illustrative photographs and charts and the Bills and McDonald color plate for the line test for vitamin D (E. S. R., 56, p. 10). Numerous references to the original literature are given as footnotes throughout the volume.

The physiological effects of tropical climate, E. S. Sundstroem (*Physiol. Rev., 7 (1927), No. 2, pp. 320–362*).—An extensive review of the literature on various physiological effects of tropical climate, including the author's own investigations which have been noted previously (E. S. R., 56, p. 393). A list of 194 references to the literature is appended.

Health of a carnivorous race: A study of the Eskimo, W. A. Thomas (*Jour. Amer. Med. Assoc., 88 (1927), No. 20, pp. 1559, 1560*).—This is a report of the physical examination, particularly for evidences of renal and vascular disease, rickets, and scurvy, of a large number of Eskimos of northern Labrador and Greenland during the MacMillan arctic expedition of 1926. The Greenland Eskimos, living almost entirely on raw meat, showed no increased tendency to vascular and renal disease and were entirely free from rickets and scurvy. Among the Labrador Eskimos, who have learned to eat cooked meat and whose diet consists largely of dried potatoes, flour, canned goods, and cereal products, scurvy, rickets, and combinations of the two diseases were found to be almost universal.

Basal metabolism in health and disease, E. F. DuBois (*Philadelphia: Lea & Febiger, 1927, 2. ed., rev., pp. VIII+17–431, pl. 1, figs. 92*).—A revision of the volume previously noted (E. S. R., 52, p. 862). The most important changes have been in the chapters dealing with surface area and normal standards, which have been rewritten and rearranged to include recent contributions on the subject.

Diet determinations: A graphic method, D. W. Richards, Jr., and A. F. Coburn (*Arch. Int. Med., 39 (1927), No. 1, pp. 93–97, figs. 2*).—A chart is presented for the determination of the protein, fat, and carbohydrate constituents

of diets of any caloric content up to 5,000 calories and for a range of fat-carbohydrate ratios from 1:2 up to 4:1.

The need of studies of the mineral nutrient contents of foods and feeds, P. E. Howe (*Science, 65 (1927), No. 1692, p. 546*).—Attention is called by the chairman of the subcommittee on animal nutrition of the National Research Council to the need of more extensive studies of the mineral content of foods and feeds. "We believe that the mineral nutrients of each agricultural crop, each food, and each feed should be studied in extensive series of samples selected to represent significant environmental conditions or methods of preparation; and it is especially to be desired that such analyses should cover not only the organic nutrients, and those inorganic elements ordinarily considered as nutrients, namely, sodium, potassium, calcium, magnesium, sulfur, phosphorus, chlorine, iodine, and iron; but also those others the functions or effects of which are much less perfectly known, namely, manganese, fluorine, bromine, silicon, boron, aluminum, copper, arsenic, and zinc."

What metabolic research has taught in nutrition of children, M. S. Rose (*Nation's Health, 9 (1927), No. 2, pp. 21–23*).—A nontechnical discussion of the dietary requirements for the normal nutrition of children as determined by recent nutrition investigations, with suggestions for the general organization of the diet to meet these requirements.

A résumé, with comments, of the available literature relating to posture, L. Schwartz (*Pub. Health Rpts. [U. S.], 42 (1927), No. 18, pp. 1219–1248*).—This résumé consists of brief annotations on over 150 papers on posture, grouped under various subheadings. The author's comments on this survey of the literature are as follows:

"There is a lack of agreement in the various definitions of standards and tests for good posture. Heredity, type of build, balance of muscle strength, and tone have not been given sufficient importance in establishing standards for posture. It has not been established whether the faulty postures associated with certain diseases are the causes or the results of these diseases. There is no universally satisfactory test for physical fitness."

The influence of irradiation upon oxidation products of cholesterol, F. W. Schlutz, M. R. Ziegler, and M. Morse (*Jour. Biol. Chem., 73 (1927), No. 1, pp. 209–213*).—In an effort to determine the relation of the antirachitic vitamin to cholesterol, α- and β-cholesteryl oxides, hydroxycholesterol, and α-cholestantriol, untreated and irradiated, were tested for antirachitic properties, with negative results, thus eliminating certain oxidation products of cholesterol as antirachitic factors. This is thought to furnish additional evidence that cholesterol itself is not the substance which becomes activated on irradiation, but that some impurity in cholesterol is the potent factor.

The antirachitic value of irradiated cholesterol and phytosterol.—VII, The effect of irradiated cholesterol on the phosphorus and calcium balance, A. F. Hess and E. Sherman (*Jour. Biol. Chem., 73 (1927), No. 1, pp. 145–151*).—In continuation of the studies previously noted (E. S. R., 56, p. 202), data on the phosphorus and calcium metabolism in normal rats, untreated rachitic rats, and rachitic rats treated with 2.5 mg. daily of irradiated cholesterol in linseed oil are reported, indicating a definite increase in the retention of phosphorus and calcium as a result of the irradiated cholesterol.

It was found impossible to raise the blood calcium of dogs to values above normal by feeding large amounts of irradiated cholesterol or to bring the blood calcium of parathyroidectomized dogs to normal level in the same way.

A study of the vitamin content of widely used Georgia foods (*Georgia Sta. Rpt. 1926, pp. 152–154, figs. 2*).—As judged by preliminary experiments

which are to be repeated before definite conclusions can be drawn, the Georgia Rocky Ford cantaloupe is a good source, late fall turnip greens an excellent source, and native peaches a comparatively poor source of vitamins A and B.

Quantitative studies of vitamins A, B, and C in green plant tissues other than leaves, E. J. QUINN, M. P. BURTIS, and E. W. MILNER (*Jour. Biol. Chem., 72 (1927), No. 2, pp. 557–563*).—In this study the method of determining vitamin A and the unit expressing the results were those of Sherman and Munsell (E. S. R., 54, p. 89), the method for vitamin B that of Sherman and Spohn (E. S. R., 51, p. 368), and for vitamin C that of Sherman, La Mer, and Campbell (E. S. R., 46, p. 865). The units for vitamins B and C were those suggested by Sherman (E. S. R., 55, p. 691), the unit for B being the amount of food required for maintenance of weight during an experimental period of 8 weeks and for C the amount required to afford complete protection from scurvy to a standard guinea pig for 90 days.

Two series of tests were made of the vitamin A content of green string beans, one in the summer and fall of 1923 and the other in the summer of 1926. On the unit basis, the beans of the first series contained less than 5 units of vitamin A per gram and those of the second series over 10 units per gram. "Whether or not the differences found can be attributed to conditions under which the beans were grown, such as soil, irrigation, or weather, it is significant that there may be considerable variation in the vitamin content of a natural product of this kind, and any attempt at comparisons of foods for their vitamin A content should take cognizance of the possibility of such variations, and also of the fact that methods have now been developed which permit of their quantitative study." The vitamin A value of green peppers was about 10 units per gram, or practically the same as the string beans of the second series.

The vitamin B value for the string beans of both series was about 0.3 unit per gram and that of the peppers practically the same. The vitamin C values of the peppers and string beans were 1 and 0.25 units, respectively.

In comparison with other plant tissues, it is concluded that both the string beans and the green peppers contain vitamin A in about the same concentration as lettuce, more than in cabbage, and considerably less than in spinach. Both string beans and peppers are about equal to lettuce or cabbage, but not as good as spinach in their content of vitamin B. The amount of vitamin C in peppers is as high as in any plant material hitherto studied, such as the raw leaf tissue of cabbage or spinach or the juice of orange or lemon.

Quantitative differentiation of vitamins A and D, I, H. C. SHERMAN and M. C. HESSLER (*Jour. Biol. Chem., 73 (1927), No. 1, pp. 113–120*).—A further study of the possible necessity in the Sherman-Munsell method of determining vitamin A (E. S. R., 54, p. 89) of furnishing an additional supply of vitamin D by irradiating the basal ration or by supplying irradiated cholesterol in the ration is reported, with the conclusion that "unless both the character of the food and the bodily store of vitamin D in the test animals have been established by previous experimentation, irradiation or the feeding of irradiated food to ensure an adequate supply of vitamin D is a wise precaution. The extent of the difference which this may make varies widely with the stock diets used in different laboratories."

The evidence upon which this conclusion was based consisted in comparing the growth of nonirradiated and irradiated rats on the Sherman-Munsell basal ration with carrots as the sole source of vitamin A, these having previously been shown to contain less vitamin D in relation to A than butterfat. Quantitative determinations of the body calcium of the two groups of rats gave inconclusive results.

In connection with this study, a comparison was made of the calcium content of the femurs and of the total bodies of the same rats. In 56 determinations conducted on young rats, aged 80 to 120 days, whose growth had been inhibited in varying degrees by a shortage of vitamin A, the mean values of the ratio of total body calcium to femur calcium was 14.138, with a probable error of ±0.135, a standard deviation of 1.500, and a coefficient of variation of 10.6 per cent. It is concluded that in similar investigations a convenient approximation of the total calcium content of the body may be obtained by multiplying the femur calcium by 14.14.

The influence of light and heat on the formation of vitamin A in plant tissues, K. H. Coward (*Jour. Biol. Chem., 72 (1927), No. 2, pp. 781–799, figs. 11*).—Using as the source of vitamin A etiolated shoots of wheat and white and yellow corn untreated and exposed to the light from a quartz mercury vapor lamp, the author has demonstrated that etiolated shoots may contain small quantities of vitamin A when grown to a height of about 10 to 12 cm. (4 to 5 in.) above the ground; that the formation of vitamin A in the shoots is accelerated by exposure to the light from a quartz mercury vapor lamp, but that the short ultra-violet rays involved in the synthesis of vitamin D do not take part in the synthesis of vitamin A; that, within reasonable limits, excessive illumination of the plant tissue does not have a destructive effect on the vitamin A formed in the tissue; and that the amount of vitamin A in etiolated shoots varies inversely with the temperature at which they have been grown.

Resistance of fat-soluble vitamins to hydrogenation [trans. title], L. Randoin and R. Lecoq (*Ann. Falsif., 19 (1926), No. 215, pp. 518–523, pl. 1, fig. 1*).—In this study cod-liver oil was subjected to hydrogenation, with reduced nickel as catalyst, in an apparatus of an industrial type. Two different processes were employed—heating for 6 hours at from 180 to 190° C. and for 8 hours at from 120 to 130°. The first gave a solid, practically odorless fat with a melting point of 53 to 55° and an iodine number of 28.69, and the second a fat of granular texture and disagreeable odor and taste with a melting point of 42 to 44° and an iodine number of 64.93. These two hydrogenated fats, untreated cod-liver oil and butterfat, were fed to the extent of 2 per cent of the ration to rats which had been rendered definitely rachitic, as shown by radiographic examination, on the Sherman-Pappenheimer diet 84.

After 9 days on the diet thus supplemented, the rats receiving fresh cod-liver oil showed normal calcification and those receiving butter a marked improvement in calcification, while those receiving the hydrogenated oils showed no improvement as judged by radiographic examination. Ten days later the epiphyses of all of the rats appeared practically normal, but the animals on the hydrogenated oils were sensitive to the touch, showing that, although the rachitic lesions had healed spontaneously, a condition of osteoporosis remained. During the entire experiment there was slow but constant growth in all of the animals. Those on the oil hydrogenated at the higher temperature showed evidences of xerophthalmia, however, at the end of the second month.

It is concluded that butter (particularly summer butter) is not as low in the antirachitic factor as formerly supposed, and that margarines prepared from commercially hydrogenated oils are very inferior to fats or natural oils as sources of fat-soluble vitamins.

Antiricketic substances.—VI, The distribution of vitamin D, with some notes on its possible origin, C. E. Bills (*Jour. Biol. Chem., 72 (1927), No. 2, pp. 751–758*).—In this continuation of the series of studies previously noted (E. S. R., 57, p. 197), data are reported on the vitamin D content of a large

number of oils of animal and vegetable origin, and the possible synthesis of vitamin D is discussed. The tests consisted in determining the minimum dose of the oil capable of producing distinct healing in rachitic rats during a 5-day period as judged by the line test. The McCollum rachitic diet 3143 was used, and the oils were administered by trituration with the basal diet. The average activity of Newfoundland medicinal cod-liver oil, which induces distinct healing in 5 days at a level of ¼ per cent, was given the value 100.

As computed on this scale the values of the oils tested were puffer fish liver 1,500, goosefish liver, herring, and sardine 100, menhaden and shark liver 75, the fatty tissues of muddy catfish and coalfish liver 40, salmon trimmings 20, haddock liver 10, channel catfish (visceral fat) and squid 6, and caplin, dogfish liver, and adult seal blubber 3. Oils which failed to induce any healing at a 4 per cent level were seal blubber (new born), whale blubber, commercial hydrogenated cod liver, ether-extracted veal fat, commercial oleo, edible white coconut, edible cotton seed, linseed, edible maize, and olive and peanut oils.

The fact that during the season in which the oil content of cod livers increases most rapidly the fish feed almost exclusively on caplin, shown to be a poor source of vitamin D, is thought to suggest the possibility that the fish is capable of synthesizing vitamin D. A comparison of the vitamin D content of the visceral fat of catfish, which had been fed for six months on veal, with that of normal controls showed no difference in potency. Irradiation of the fish did not increase the vitamin D content of the fat.

A study of the pellagra-preventive action of the tomato, carrot, and rutabaga turnip, J. Goldberger and G. A. Wheeler (*Pub. Health Rpts.* [*U. S.*], *42* (*1927*), *No. 19*, *pp. 1299–1306*).—In continuation of the investigation at the Georgia Sate Sanitarium of the pellagra-preventing action of various foods (E. S. R., 55, p. 890), tomatoes, carrots, and rutabaga were tested.

Daily supplements of either cooked carrots or cooked rutabaga in amounts equivalent to 453 gm. (1 lb.) of the dressed raw vegetable were of no value as a pellagra preventive. The expressed juice of canned tomatoes in amounts of approximately 1,200 gm. had a well-marked preventive action. It is considered probable that if larger amounts of carrots and rutabaga could have been fed they would have shown some pellagra-preventing action in harmony with the present belief that the pellagra-preventing factor is identical with one of the constituents of vitamin B, which is known to be present in these vegetables. In localities where pellagra is endemic, a more liberal use of tomatoes, particularly during late winter and spring, is recommended as a preventive measure.

Method for determining the antiscorbutic value of a foodstuff by means of histological examination of the teeth of young guinea-pigs, A. Höjer (*Brit. Jour. Expt. Path.*, *7* (*1926*), *No. 6*, *pp. 356–360*, *pl. 1*).—In this paper, which should be consulted in the original for details of technique and diagrams, a method for the diagnosis of guinea pig scurvy is described which consists essentially in the examination of cross sections of the incisor teeth of the experimental animals, killed after from 10 to 14 days on the test diet. Some sections are stained with hematoxylin-eosin and others with trioxyhematin according to the method of Hansen. The appearance of the stained sections is described in full, with a scheme for grading the antiscorbutic value of foods in decimal parts of protective doses from the appearance of the tooth sections.

The method is recommended as being quite as accurate as the usual method and having the advantage of requiring much less time.

Malabsorption in deficiency diseases, F. L. Burnett and P. R. Howe (*Jour. Amer. Med. Assoc.*, *88* (*1927*), *No. 22*, pp. *1705–1709*, *figs. 5*).—This is a review and discussion of the literature on malabsorption in experimental vitamin de-

ficiency diseases and in human deficiency disorders, including rickets, beriberi scurvy, pellagra, and metabolic diseases, with the conclusion that "if the restricted limits of normal absorption are applied to the metabolic diseases, the faulty food factors of eating too fast and too much, too little food, badly proportioned diets or habitually using physic or enemas act somewhat like food without the necessary substances in producing intestinal indigestion and malabsorption."

The relation of vitamin E to iron assimilation, N. SIMMONDS, J. E. BECKER, and E. V. McCOLLUM (*Jour. Amer. Med. Assoc., 88 (1927), No. 14, pp. 1047–1050, fig. 1*).—A further investigation of the cause of the appearance of ophthalmia in rats on certain diets furnishing adequate amounts of vitamin A (E. S. R., 53, p. 767) has led to "an entirely new explanation of the phenomenon of the so-called salt ophthalmia." It was found that rats debilitated by the ophthalmia-producing diet could be restored to health by giving them wheat germ oil (a rich source of vitamin E) or by substituting ferric citrate for ferrous sulfate in the salt mixture of the defective diet. This suggested a possible relationship between vitamin E and iron, and data were obtained confirming this hypothesis. Although no studies have been carried out which might serve to explain the relation between faulty iron assimilation and the resorption of the young on a so-called sterility diet, it is suggested that "a plausible explanation of the death of the embryos would seem to be that with deficiency of vitamin E their iron assimilation is disturbed, especially when the iron content of the diet is low. We believe that our data afford convincing evidence that in vitamin E we have a substance specifically related to iron assimilation in a manner comparable to the relation of vitamin D to phosphorus and calcium metabolism. In the light of these unexepected correlations between the utilization of two vitamins and certain mineral elements, it will be worth a careful search to find whether each of the other mineral elements has a companion substance (vitamin) which must accompany it in order that physiologic utilization may be possible."

The favorable effects of liver in the treatment of pernicious anemia, as reported by Minot and Murphy (E. S. R., 56, p. 294), are thought to be due to the presence not only of iron but of vitamin E in the liver. Attention is also called to the fact that the diets used by Koessler, Maurer, and Loughlin (E. S. R., 56, p. 293) in the production of pernicious anemia in rats were deficient in vitamin E and iron, as well as in vitamin A, and that this deficiency might well have been the cause of the anemia.

A guide for diabetics, W. R. CAMPBELL and M. T. PORTER (*Baltimore: Williams & Wilkins Co., 1926, pp. 259, fig. 1*).—This handbook, which is based upon the experience of the authors at the Toronto General Hospital, contains in condensed form the essential facts about diabetes and its control by diabetic treatment and insulin, precautionary measures that must be taken by diabetic patients to ward against infection, an explanation of the actual construction of menus for the diabetic from dietetic prescriptions, and special recipes, with calculated food values. An unusual feature is the chapter on traveling, in which suggestions are given for safe combinations of foods when it is impossible to weigh them. The volume is made up with alternate blank pages for recording notes, additional recipes, etc.

Endemic thyroid enlargement in Massachusetts, R. OLESEN and N. E. TAYLOR (*Pub. Health Rpts. [U. S.], 42 (1927), No. 12, pp. 804–816, figs. 2*).—This report of thyroid survey in Massachusetts, including 7,140 boys and 10,057 girls in 57 localities and attending high school or upper grades of the grammar school, shows some degree of enlargement in 8.7 per cent of the boys and 22 per cent of the girls. Most of the enlargements were of such a slight degree as to warrant the conclusion that there is no necessity for universal prophylaxis in the

State. The extent of goiter varied widely in different sections of the State, being considerably higher in the central and western sections than on the coast.

The distribution of iodine with special reference to goiter, J. F. McClendon (*Physiol. Rev., 7 (1927), No. 2, pp. 189–258, figs. 7*).—An extensive review of the literature, with a bibliography of 193 titles.

Changes in composition of blood in pernicious anemia treated by a diet rich in liver, W. P. Murphy, R. T. Monroe, and R. Fitz (*Jour. Amer. Med. Assoc., 88 (1927), No. 16, pp. 1211–1214, figs. 4*).—Analyses of the blood of 10 of the patients receiving the dietary treatment for pernicious anemia noted previously (E. S. R., 56, p. 294), made before and at intervals during the treatment, corroborate the previous observations of a prompt and rapid remission of the anemia in every case. No changes were noted in the nonprotein nitrogen of the plasma or in the plasma protein, but the protein of the corpuscles increased notably and in almost direct proportion to the increasing hemoglobin concentration.

TEXTILES AND CLOTHING

The cotton year book, 1927 (*London: Indus. Newspapers Ltd., 1927, 22. ed., pp. XCVII–CVIII+696, figs. 188*).—The information compiled deals with economic conditions in the cotton industry, manufacturing methods and equipment, power, warehousing, management, and associations of employers and operatives. A section is devoted to rayon.

Changes in the tenacity and elongation of artificial silk in the normal and wet conditions, II, Y. Kami (*Cellulose Indus. [Tokyo], 2 (1926), pp. 39, 40; abs. in Jour. Soc. Chem. Indus., Brit. Chem. Abs. B, 46 (1927), No. 7, pp. 102, 103*).—The loss of tenacity of rayon is greater in boiling water than in that at normal temperature, and the loss increases as boiling is prolonged. This increased loss is partly attributable to expansion of occluded gas and consequent disruption of the cohesive forces of the cellulose molecules, and partly to mechanical disturbance due to ebullition. The elongation is generally diminished in the same manner. Drying the boiled rayon at a high temperature injures its tenacity and elongation, but if the material be air dried not above 35° [C.] the physical characteristics are restored substantially to their original value. Under these conditions boiling for less than 30 minutes does not affect the tenacity and elongation, but longer boiling, e. g., for 1 hour, produces a permanent alteration in the physical properties which may be likened to elastic fatigue.

Deterioration of abaca (Manila hemp) fiber through mold action, F. B. Serrano (*Philippine Jour. Sci., 32 (1927), No. 1, pp. 75–101, pls. 10, figs. 2*).—Defective abaca fiber is characterized by weakness, brittleness, a dull, dirty, dark color, and a musty odor, which is stronger in moist fiber than in dry. According to this investigation, the action of organisms belonging to the cellulose digesting types, e. g., *Aspergillus flavus*, *A. fumigatus*, *A. glaucus*, *A. niger*, *A. wentii*, *Penicillium glaucum*, *Chaetomium elatum*, *C. funicolum*, *C. olivaceum*, and *C. olivaceum chartarum*, will cause deterioration when conditions favor their growth. Sometimes *Alternaria* sp. may be present and also cause damage. Factors conducive to rapid deterioration of fiber by the cellulose digesting molds include abundant moisture content, poor or partial cleaning, long storage of moist fiber, inadequate ventilation in the warehouses, and lack of care in handling. Elimination of these factors would probably minimize deterioration due to molds.

Preserving tobacco shade cloth, H. P. Holman and T. D. Jarrell (*Textile World, 71 (1927), No. 19, p. 85*).—In experiments by the U. S. Department of

Agriculture, cooperating with the Connecticut Tobacco Substation, tobacco shade cloth was treated with lead chromate and with asphalt and lampblack and compared with untreated cloth. The color of the treated cloth had no noticeable effect on the growth and quality of the tobacco.

Tensile strength tests after one season's exposure indicated that the cloth treated with lead chromate had lost 5 per cent of its strength, that the cloth treated with asphalt and lampblack had lost 14 per cent, and that untreated cloth had lost 47 per cent. After two seasons' exposure cloth treated with lead chromate was still stronger than untreated cloth after one season's exposure. The results suggest that the lead chromate treatment is the better, and that shade cloth heavily treated with lead chromate can undoubtedly be used a second season.

The dyeing of textile fibres, R. S. Horsfall and L. G. Lawrie (*[London]: Ernest Benn, 1927, pp. X+415*).—In its successive chapters this volume deals with cotton; the treatment of cotton before dyeing; dyeing of cotton; bast fibers; dyeing of rayons; wool; treatment of wool before dyeing; dyeing of wool; silk; indigo, indigosol, and soledon dyestuffs; dyeing of union fabrics; testing and valuation of dyestuffs; water; agents; and chemicals used in the dyeing industry. The bibliography embraces 185 titles.

Knitting: Its products and processes, J. F. Caplin (*New York: Dry Goods Econ., 1927, pp. V+93, figs. 28*).—This concise survey of knit goods manufacture from the raw material to finished merchandise treats of characteristics of knit fabrics; wool, silk, cotton, linen, rayon, and fiber combinations for knitting; the fundamentals of knitting and knitting processes; warp knit fabrics; and hosiery.

Fitting dresses and blouses, M. Campbell (*U. S. Dept. Agr., Farmers' Bul. 1530 (1927), pp. II+30, figs. 24*).—This publication has been prepared to give assistance on the fitting of women's dresses and blouses by describing and illustrating where the lines of the well-fitted garment should fall in relation to the figure and giving methods for correcting the common defects in each part of the garment. Practical suggestions are included for the selection of patterns for different types of figures and materials for different types of garments, for cutting from patterns, and for fitting foundation patterns.

Footwear, compiled by E. T. Shively (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 1 (1927), pp. 29*).—An annotated bibliography on books and periodical literature "on the fitting of shoes, foot structure, corrective foot exercises, shoe history and design, the manufacture of shoes, hosiery, and shoe care and repair. Except for some periodical articles which have seemed too brief or of too little value, everything that could be found on the fitting of the foot has been included. On the other hand, the references to foot structure and exercises for the feet have been chosen only as they seem to relate closely to fitting. Throughout the bibliography the interests and needs of home economics workers have been kept in mind."

Leather shoes: Selection and care, F. P. Veitch, R. W. Frey, and H. P. Holman (*U. S. Dept. Agr., Farmers' Bul. 1523 (1927), pp. II+22, figs. 18*).—In this revision of Farmers' Bulletin 1183 (E. S. R., 44, p. 586), practical information is given on the varieties and trade names of shoe leathers and on the construction, selection, and proper care of shoes.

MISCELLANEOUS

Report of the [California] Agricultural Experiment Station, [1926], E. D. Merrill (*California Sta. Rpt. 1926, pp. 3+102, fig. 1*).—This contains the organization list, a report of the director and summary of the work of the

station for the year ended June 30, 1926, including data as to projects and publications, and a summary, by B. H. Crocheron, of the work of the agricultural extension service (pp. 96–102). The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report [of Georgia Station], 1926, H. P. STUCKEY (*Georgia Sta. Rpt. 1926, pp. 117–160, figs. 6*).—This contains the organization list, a report by the director of the station on its work during the year, and a financial statement for the fiscal year ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of West Central Experiment Station, Morris, 1926, P. E. MILLER (*Minnesota Sta., Morris Substa. Rpt. 1926, pp. 42*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-seventh Annual Report [of New Mexico Station, 1926], F. GARCIA (*New Mexico Sta. Rpt. 1926, pp. 62, figs. 3*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the year ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

Forty-ninth Annual Report of the North Carolina Agricultural Experiment Station, [1926], R. Y. WINTERS ET AL. (*North Carolina Sta. Rpt. 1926, pp. 78, figs 17*).—This contains the organization list, a report of the director and heads of departments, and a financial statement for the fiscal year ended June 30, 1926. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station [March–April, 1927] (*Ohio Sta. Bimo. Bul., 12 (1927), No. 2, pp. 33–64, figs. 13*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Land Utilization and Index Numbers of Production, Wages, and Prices, both by J. I. Falconer.

NOTES

Connecticut College.—The degree of doctor of science was conferred upon President C. L. Beach by Wesleyan University at its recent commencement.

Illinois University and Station.—*Illinois Agriculturist* announces that J. H. Longwell, associate in animal husbandry, has resigned to accept a position at the West Virginia University, and that W. S. Brock, assistant professor of horticulture and assistant chief in systematic pomology, has resigned.

Massachusetts College.—The college, at its recent commencement, conferred the first honorary degree in its history, its retiring president, Dr. E. M. Lewis, now president elect of the University of New Hampshire, as previously noted, receiving the degree of doctor of laws.

The obituary notice of the late Dr. Charles E. Marshall in an earlier issue (E. S. R., 56, p. 606) inadvertently attributed to him the organization of the Graduate School in 1912. This school was in reality established in 1908, Dr. C. H. Fernald serving as director until his retirement from the college in 1910 and Dr. H. T. Fernald as acting director from 1910 to 1912. At the time of Dr. Marshall's appointment, the school had thus been in operation for several years. Numerous courses had been organized, there was an enrollment of 16 students, and 22 degrees had been conferred.

Missouri University and Station.—Four new projects were begun July 1. These are entitled, respectively, a quantitative study of the factors of color, texture, and flavor and their influence on the quality and palatability of meat; the process of community organization; corn breeding; and the age changes in energy metabolism of growing domestic animals.

A cooperative study is under way, by the station and the U. S. Department of Agriculture on a farm at Grain Valley, of beef cattle production with special reference to cow herds and baby beeves, the results indicating the possibility of grain feeding of calves while nursing and marketing them at 8 months of age. A meeting held at this farm recently was attended by about 300 people, and inquiries have been received from more than a dozen States concerning the work.

Arrangements have been made with the home economics department to conduct cooking tests on the meat produced in the beef cattle feeding experiments, as a part of the quality-of-meat project. Members of the Medical School staff are also cooperating in histological studies of the meat.

Dr. Fred F. McKenzie, instructor and assistant in animal husbandry, has resigned to accept a position as director of the College of Agriculture at the International College, Smyrna, Turkey. James E. Comfort and Hubert Moffett, 1927 graduates of the College of Agriculture, have been appointed assistants in animal husbandry, beginning September 1.

North Dakota Station.—The State appropriation for the support of the substations during the ensuing biennium has been increased from $17,000 to $55,000.

Porto Rico Insular Station.—F. A. López Domínguez has resigned as director, effective about August 1, to engage in commercial work in Peru.

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EXPERIMENT STATION RECORD

Vol. 57 September, 1927 No. 4

The large economic importance which poultry husbandry, traditionally looked upon as a more or less incidental phase of farming, has come to assume in the world's agriculture and daily life was convincingly demonstrated at the Third World's Poultry Congress, held at Ottawa from July 27 to August 4, 1927. This congress brought together a registration of more than 2,000 and an aggregate attendance much in excess of this number, representing nearly 40 foreign countries, all of the Canadian Provinces, and practically every State in the United States. It attested by the numbers and cosmopolitan nature of its delegates not only the widespread public interest in the once lowly "barnyard hen," but also the substantial progress and recognition which has come to the poultry industry following its remarkable development in recent years under the guidance of research and education and the stimulus of intelligently directed private initiative.

It may not be generally realized how largely these international poultry meetings have been due to the enthusiastic and untiring efforts of a single individual, Mr. Edward Brown of London. After many years of active interest in the promotion of the poultry industry, Mr. Brown succeeded in bringing together in London in 1912 representatives of several nations, who proceeded to organize the International Association of Instructors and Investigators in Poultry Husbandry. Naming Mr. Brown as its first president, this association planned to hold the first world's poultry meeting in 1916. This gathering was prevented by the World War, but late in 1918 the matter was again taken up, an invitation from the Netherlands to hold the First World's Poultry Congress at The Hague was accepted, and the congress was duly brought to completion in 1921. A second congress was held at the invitation of the Spanish Government at Barcelona in 1924. Both these congresses were deemed very successful, but that at Ottawa, the first in the Western Hemisphere, greatly excelled in size of attendance, exhibits, and particularly in widespread public interest either of its predecessors.

All of the congresses have had the benefit of the leadership of Mr. Brown as president of the association, and his decision to retire from active service in that capacity was received with much regret. Provi-

sion was made for the continuance of his connection with the movement by his election to the newly-established office of honorary past president. During the congress he was presented with a considerable purse of gold from international and national societies and private individuals as a tangible mark of the esteem with which he is regarded by the poultrymen of the world, and on August 5 the honorary degree of doctor of laws was conferred upon him by McGill University.

The congress was sponsored by the British and Canadian Governments, and their official connection with it was manifested in many ways. At the opening session the delegates were formally welcomed by the Governor General, the Canadian Prime Minister, the Minister of Agriculture of the Dominion, and the mayor of Ottawa. Responses to these greetings were made by the United States Minister to Canada, the president of the Netherlands delegation, and Don Salvador Castello, founder and director of the Royal Spanish Poultry School of Barcelona. Later in the congress a garden party was given the delegates by the Minister of Agriculture on the beautifully landscaped grounds of the Central Experimental Farm, and the congress exhibits were officially inspected by the Prince of Wales.

As previously indicated the attendance was world-wide in its scope. All of the principal continental European countries were represented except Greece, Norway, Sweden, and the Union of Socialistic Soviet Republics, and the delegations from England, Ireland, and Scotland were quite large. South Africa and Egypt, India, Japan, Persia, and Australia were also represented, and as would be expected all of the larger countries of both North and South America.

The attendance from the United States was very large, probably exceeding that from all other sources. In accordance with a request of President Coolidge under the terms of a joint resolution of Congress enacted April 21, 1926, a group of 21 delegates headed by the Assistant Secretary of Agriculture was designated by the Secretary of Agriculture from the Department's staff and the large organized interests of the poultry business of this country as its official representatives. This group was augmented by hundreds of others from the Department, the agricultural colleges and experiment stations, and other institutions, and, most numerous of all, the commercial poultrymen and others interested in various phases of the industry.

The congress as a whole probably exceeded in numbers any similar international gathering of interest to agriculture. Its magnitude created real problems as to accommodations and working conditions, but these were overcome to a degree which brought forth many expressions of commendation. Hotel privileges were available for all delegates from overseas, and the homes of the city were freely drawn

upon to meet the needs of others. In general, adequate meeting places were available, notably the spacious auditorium with a seating capacity of several thousand persons, and the exhibition was provided with exceptionally good quarters. A spirit of hospitality prevailed, and every effort was apparently made for the comfort and entertainment of those in attendance.

One of the distinctive features of the congress was a banquet arranged by the Canadian Society of Technical Agriculturists, with speeches by representatives of the society, the Ontario Agricultural College, the U. S. Department of Agriculture, the British Ministry of Agriculture, and the delegations from Spain, Scotland, and Egypt. Numerous trips by automobile to points of interest around Ottawa were also conducted. At the close of the congress a nine-day capital to capital tour from Ottawa to Washington, arranged on invitation of Secretary of Agriculture Jardine, attracted many of the delegates. The itinerary of this trip included visits to the Ontario Agricultural College, the experiment stations of New York and New Jersey, and the U. S. Department of Agriculture, as well as commercial plants at Montreal, New York, and Philadelphia. Another tour was arranged for delegates who desired to see more of Canada, this group going from Ottawa to the Pacific coast.

As at the previous poultry congresses, an important adjunct was the international poultry exhibition. This exhibition, continued throughout the congress, was noncompetitive and of high educational value as well as strong popular appeal. Of greatest interest to most visitors were the live birds, numbering over 8,000 and representing 146 of the breeds and varieties now standardized in North America. An auction sale at the end of the congress served to aid the industry materially in a practical and permanent way by its wide dissemination of this high-grade breeding stock. The exhibits were for the most part from the United States, Canada, England, and the Netherlands, that of Great Britain including a number of birds sent over by King George and the Prince of Wales.

Among the many educational features was an Egyptian mud house incubator similar to the native incubator which has been in use in that country for centuries. From England came a model of an ideal poultry farm and a fattening plant, together with other interesting material. A pen of the original Indian jungle fowl, *Gallus bankiva*, exhibited by the United Provinces of India, was another center of general attraction. The German exhibit specialized in poultry pathology, while those of Canada, Italy, Spain, and Bermuda dealt with various phases of the poultry industry in an instructive and interesting way.

The United States exhibit, prepared with a special appropriation of $20,000 granted for participation in the congress, was designed, in

the words of its authorization, to portray "in a correlated manner the fundamental features concerning the organization and development of the poultry industry of the United States, including the broad problems of production, distribution, and marketing of poultry and poultry products." It occupied over 4,000 sq. ft. of space, and was assembled under the joint direction of the Bureaus of Animal Industry, Agricultural Economics, and Home Economics. The growth of the industry was traced from its inception in the bringing of a few fowls to Virginia by Capt. John Smith early in the seventeenth century, through its status in 1840 when its first census showed a value of $12,176,170, to the 1926 estimate of $1,263,707,000. Progress in improving the quantity and quality of poultry products, the evolution of the chick industry, and the development of more efficient ways of marketing poultry were also depicted by moving pictures, charts, and other illustrative material. A special feature that was enthusiastically received was the giving of demonstrations on progress in incubation and breeding by 4-H clubs from Vermont, Connecticut, Michigan, and Nebraska.

Aside from what was termed an "international meeting" in the evening of the opening day and the official closing ceremonies, the congress carried on its activities mainly through five sections, dealing respectively with marketing, nutrition, breeding, disease, and extension. Most of these sections held from three to five sessions, and there were also two "general" sessions at which a variety of papers was presented and a single session devoted to baby chick problems. The various sectional programs occupied the three-hour period beginning at 9.30 a. m. daily, leaving the remainder of the day free for other purposes.

The total number of papers scheduled on the program approximated 150, but many of these were in the absence of their authors ead by title only. The number of papers actually presented was, herefore, relatively small for a congress of its duration, and despite he brevity of the working day there was comparatively little conestion and considerable opportunity for discussion, which was freely vailed of and apparently greatly appreciated. No attempt was nade to provide abstracts of the various papers, but this was probbly less of a handicap than in some other congresses of more techical scope and with greater linguistic difficulties. Although a few apers were given in French, which with English constituted the ficial language of the congress, the assembly was predominantly nglish speaking, and progress was correspondingly rapid.

The general sessions dealt largely with the status of the industry foreign countries and the raising of turkeys and ducks, with a

single paper on rabbits, which outlined conditions in Belgium. They were held concurrently with the sectional programs, and their principal function was apparently to provide opportunity for papers of specialized appeal.

The breeding section held five sessions with a large attendance, well-sustained interest, and plentiful discussions. The 40 papers offered were contributed by 12 countries, about half being devoted to the practical aspect of the subject and the remainder to technical genetics problems, notably the inheritance of various characters. The more practical phases included such matters as the conducting of egg-laying contests and methods of recording in different countries, the origin of breeds, and the breeding of exhibition poultry.

The marketing section also held five sessions, and these, while not the most largely attended, were probably among those with keenest interest. Such topics as the marketing of eggs and live and dressed poultry, the quality and standardization of poultry products, and cooperation in poultry marketing were presented by representatives of six countries, and vigorously discussed by investigators, poultry men, and commercial agencies from their respective viewpoints and on a common footing.

The nutrition section had a large attendance at each of its three meetings. Problems in poultry feeding were presented from both a practical and experimental point of view. Great interest was shown in the international aspect of these problems, and the discussions indicated the vital concern of investigators in the work being done in other lands. Methods of feeding, the influence of various nutrients upon birds, and especially the status of knowledge as to the vitamin and mineral requirements were among the leading subjects, and the exchange of ideas following the papers was limited only by the time available. Six countries were represented in this portion of the program, with 11 of the 22 papers emanating from the American experiment stations.

The section on disease attracted veterinarians, bacteriologists, parasitologists, and practical poultry men from nearly all of the countries represented, indicating that this phase of poultry work has a world-wide appeal. As was pointed out by Dr. John R. Mohler of the U. S. D. A. Bureau of Animal Industry in his opening paper, entitled National and International Control of Poultry Diseases, one of the notable recent developments is the greater amount of attention being accorded poultry diseases by the veterinary profession. This is largely because of the changed economic status, as formerly the value of a bird or even of a flock was ordinarily considered too small to justify the employment of a veterinarian. Other papers from the 13 nations participating in the section program

dealt with a number of specific diseases, and the closing session was devoted to a symposium on bacillary white diarrhea.

The program of the extension section dealt with the development of poultry education, especially in its extension phase, in England Italy, Denmark, Canada, and the United States. The work of the boys' and girls' poultry clubs, radio and correspondence courses in poultry, the value of poultry and egg shows, and the development of poultry breeding centers were among the topics to receive attention at the three sessions of the section.

The interest and value of the congress was further enhanced by the meetings of several societies connected with the poultry industry. Among these were the annual meetings of the American Poultry Association, the Poultry Science Association, and the Canadian Baby Chick Association, and the triennial meeting of the International Association of Instructors and Investigators in Poultry Husbandry. In the last-named body, Mr. F. C. Elford, Dominion poultry husbandman and general director of the congress, was elected association president to succeed Mr. Brown. The new list of six vice presidents of the association includes Prof. J. E. Rice of Cornell University, and Dr. G. F. Heuser of the same institution was continued as secretary.

At a meeting of the international council of the congress an invitation tendered by Hon. Stanley Baldwin, Prime Minister of Great Britain, to hold the Fourth World's Congress at London in 1930 was accepted. The further organization of the congress will be taken up at a later date.

Like many other international gatherings, the World's Poultry Congress attempted no specific business, confining its purpose and its program to the interchange of information and ideas. Its accomplishments are accordingly the more difficult to measure, but although necessarily more or less intangible it by no means follows that they were either ephemeral or inconsiderable. Speaking from the broad standpoint of the general welfare, both the Governer General and the Prime Minister of Canada expressed their appreciation of the world-wide interest which the congress had aroused, and emphasized the benefit to all nations of such gatherings by meeting on common ground, exchanging ideas, and increasing international understanding and good will.

Similarly, President Brown, in his opening address declared that "the World's Poultry Congress needs no apology. What we have learned, what has been done in the past, makes us optimistic as to what may yet be attained. Our desire is to attain unity of purpose and action, and thus to link the legacy of the past with the golden

age of the future. When the history of poultry husbandry is written, the first quarter of the twentieth century will be notable by reason of the fact that during this period there came about an association of those who are qualified by scientific attainment with practical breeders and producers."

This bond between the scientific and practical seemed to many to be the greatest attainment of the congress, and it is indeed an achievement which even a generation ago seemed hardly possible of realization. It is at once a tribute to the open-mindedness and vision of both the so-called "practical" poultrymen and the specialists in poultry science, and an acknowledgment of the essential utility and fundamental value of scientific research in a specialized field. Because of this characteristic, the congress became automatically more than an industrial meeting, a propaganda for the poultry interest. It became a conference in its truest sense, for its underlying feature was the basis which science has given to this important industry.

In the closing days of the congress one of its eminent European members, Dr. Emil Schachtzabel, president of the German Poultry Breeders Association, characterized its work as "an unqualified and phenomenal success, an event outstanding in character of which coming generations may be justly proud." This is high praise, yet under the circumstances it seems abundantly justified. The adequate preparations which preceded the congress and the able manner in which the elaborate program was carried to completion brought about an achievement which will long be remembered, deeply gratifying to those in charge and a worthy example for similar meetings in the days to come.

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

An investigation of the nature of the proteins of wool, S. R. and E. R. TROTMAN and R. W. SUTTON (*Jour. Soc. Chem. Indus., 45 (1926), No. 3, pp. 20T–24T*).—By heating woolen fabric, previously purified by washing with organic solvents, with concentrated hydrochloric acid at about 70° C. most of the material dissolved, leaving a small amount of structureless residue which dissolved only very slowly. On filtering the mixture through woolen cloth and washing with hot hydrochloric acid a filtrate was obtained which gave a large precipitate on diluting and neutralizing to pH 4 to 5. The precipitate was soluble in excess of either acid or alkali. It was washed, dissolved in dilute ammonia, filtered, and reprecipitated with acetic acid, the precipitate being dialyzed in water until free from salts, treated with alcohol, filtered off, and dried at a low temperature. This material, designated protein A, contained 0.40 per cent of ash, 3.62 of sulfur, and 12.50 per cent of nitrogen. The filtrate from the first precipitation of protein A yielded a gummy water-soluble precipitate on being nearly neutralized and saturated with magnesium sulfate. This was dialyzed in aqueous solution, the solution concentrated, and the substance precipitated with alcohol and dried, the resulting preparation containing 1.12 per cent of ash, 4.05 of sulfur, and 14.57 per cent of nitrogen.

The insoluble residue from the hydrochloric acid treatment was washed as free from protein A as possible with hot hydrochloric acid. It was dissolved in dilute ammonia, was filtered through linen, and was precipitated with acetic acid, washed, dialyzed, and dried. This preparation, designated protein B, contained ash 0.10 per cent, sulfur 1.49, and nitrogen 12.68 per cent.

Analyzed by the Hausmann method, protein A gave figures reported as humin nitrogen 2.55 per cent, amide nitrogen 1.20, diamino nitrogen 12.00, and monoamino nitrogen 86.25 per cent. The corresponding figures for protein B were humin nitrogen 2.45 per cent, amide nitrogen 3.90, diamino nitrogen 34.30,' and monoamino nitrogen 59.35 per cent.

From the nature of the residue insoluble in concentrated hydrochloric acid, it was considered possible that protein B is present chiefly in the cortex, protein A coming mostly from the epithelial scales. On treatment with chlorine, with hydrogen peroxide in ammonia solution, or with warm N/1 sodium hydroxide, protein A readily lost a large part of its sulfur, but protein B was much more resistant to these treatments.

Heating with water at two atmospheres pressure dissolved from wool a protein apparently identical with the protein B above described, but the insoluble residue had a lower sulfur content than protein A and much hydrogen sulfide was set free during the digestion. The experiments described in this paper are stated to be only of a preliminary nature.

The nitrogen compounds of the rice kernel as compared with those of other cereals, S. L. JODIDI (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp.*

309–325).—The following figures are reported for oven-dried brown rice of the Wataribune, Blue Rose, and Honduras varieties, respectively: Amide nitrogen 0.14, 0.17, and 0.23 per cent of the total nitrogen of the dried kernels; amino nitrogen 0.75, 1.40, and 1.02 per cent of the total nitrogen; and polypeptide nitrogen 0.85, 1.61, and 1.15 per cent of the total nitrogen. For the proper interpretation of these results, the methods employed in securing them must be consulted in detail in the original. Total nitrogen data for a number of crops of the above varieties and of the Fortuna variety are given. The nitrogen distribution data are compared with those previously obtained (E. S. R., 53, p. 712) for other cereals.

The technology of fats and oils, K. Löffl (*Technologie der Fette und Öle. Brunswick: F. Vieweg & Son, 1926, pp. VII+510, figs. 283*).—It is the purpose of the book to present solely the technology of the fats and oils, with only so much reference to the chemistry and chemical analysis as is inseparable from the purely technological treatment. In accordance with this plan the chemical and analytical aspects of the subject are restricted to an introductory section of four rather brief chapters. The second section, seven chapters occupying nearly two-thirds of the book, is devoted to industrial preparation—processes and apparatus, and the third section, something over one-fourth of the book, deals in three chapters with margarines and similar products, with hydrogenation and its products, and with hydrolysis, including the working up of fatty acids, glycerin, etc.

Effect of vacuum distillation on vanilla extract, C. B. Gnadinger (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 342–344*).—The concentration of vanilla extracts under diminished pressure caused a loss of flavor and aroma. While this loss could not be expressed accurately in percentages, comparison by a number of observers placed the loss at not less than 10 per cent when the degree of concentration was 5 or greater, the extent of the loss depending on the variety of bean as well as on the degree of concentration. The quality of the flavor, as well as the strength, is changed, the aroma being almost entirely destroyed if the degree of concentration is high. Concentrates made from acetone extracts were found inferior to those made from alcoholic extracts. The loss of flavor and aroma was found to be due, not to decomposition or chemical change, but to volatilization of flavoring materials.

Solubilities of the antiscorbutic factor present in lemon juice, E. B. Vedder and W. E. Lawson (*Jour. Biol. Chem., 73 (1927), No. 1, pp. 215–218*).—The standard extract used in the solubility tests reported was prepared by partially neutralizing lemon juice with calcium carbonate, evaporating the solution at room temperature under an electric fan, extracting the residue with absolute alcohol, removing the alcohol by evaporation, and dissolving the residue in distilled water. Other solvents tested in the same way included anhydrous purified acetone, ethyl acetate, a 3:1 mixture of ethyl acetate and ethyl alcohol, amyl alcohol, and benzyl alcohol. Of these, only the mixture of ethyl acetate and alcohol and the benzyl alcohol gave extracts which had any curative properties, and these were not as potent as the alcoholic extract. On treatment of the aqueous solution of the alcoholic extract with various precipitants, neutral lead acetate was found to remove the bulk of the phosphorus and sulfur from the extracts without lowering the curative value, a result corroborating the findings of Zilva (E. S. R., 52, p. 710).

A natural indicator, yellow in acid and reddish brown in alkali, was found in the curative extracts. This is apparently different from the one described by Bezssonoff (E. S. R., 53, p. 608).

Laboratory fractionating columns, J. B. Hill and S. W. Ferris (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 379–382, figs. 6*).—By means of a set-up for

which the original and illustrations must be consulted, the relative efficiency of various distillation columns was determined in such a way that their ability to produce contact between liquid and vapor was the only factor entering into their relative efficiencies. The popular designs of laboratory fractionating columns were found to have lower efficiencies in this test than columns of the Hempel type with selected packings. The Snyder floating ball column and the packed column prepared with iron jack-chain were among the more effective types.

A simple reference electrode for potentiometric titrations, T. R. BALL (*Indus. and Engin. Chem., 19 (1927), No. 3, p. 370*).—A device which may be substituted for the calomel electrode in approximate acid-base titrations and in oxidation-reduction titrations is constructed as follows:

A piece of 5-mm. glass tubing about 15 cm. in length is nearly sealed at one end, a fine thread of acid-washed, long-fibered asbestos is inserted into the opening, projecting a few millimeters on either side of the constriction, and the tube is strongly heated to seal in the fiber. The tube is filled for oxidation reduction reactions with 3 N sulfuric acid or with normal potassium chloride for acidimetric titrations, and pressure is applied until a drop of the liquid passes through the asbestos. The electrode is connected to the potentiometer by a platinum wire dipping into the electrolyte. Successful titrations of dichromate with ferrous sulfate, of zinc with potassium ferrocyanide, and of silver nitrate with both sodium sulfide and ammonium sulfocyanate, a silver ribbon being used as a reference electrode in the two latter cases, are reported.

In the titration of acetic acid with sodium hydroxide the asbestos electrode system gave readings about 70 millivolts higher than the calomel hydrogen electrode system during the entire titration, but the end points were identical. This device is not recommended for any but rough determinations of pH, but may be successfully used for end point determinations.

A simple and inexpensive Kjeldahl digestion apparatus, E. G. HASTINGS, E. B. FRED, and W. H. PETERSON (*Indus. and Engin. Chem., 19 (1927), No. 3 p. 397, figs. 2*).—An apparatus in which the fumes from the Kjeldahl digestion are removed by tubes inserted in the necks of the flasks and connected with an aspirator device is described and figured. The total cost of the apparatus fitted for 12 flasks, but without the gas burners and rack, is stated to be about $50. For the details of the construction, the drawing and photograph presented with the original must be consulted.

The determination of organic matter in soils by means of hydrogen peroxide, W. O. ROBINSON (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp. 339–356*).—In experiments on the determination of the organic matter of soils by means of hydrogen peroxide, a method is described consisting essentially of the digestion of soil samples with 15 per cent of hydrogen peroxide with or without warming, as the individual case may require. The solution of several forms of organic matter, including cellulose, soil humus, crude fiber, peat, several forms of coal, etc., by hydrogen peroxide in the presence of soil was studied. Except charcoal, coal, and graphite, the substances tested were almost completely brought into solution. In soils, the organic matter was practically entirely decomposed in some samples, while in others considerable organic matter remained unattacked, the nature of which was not determined, although charcoal forms the major part of the undecomposed organic matter in some cases. The hydrogen peroxide method gives lower results than the wet or dry combustion methods, but is considered distinctly more accurate in some cases. In 26 samples analyzed, the carbon content of the organic matter averaged 58 per cent, which is in accordance with the usual factor for calculating

evolved carbon dioxide to organic matter, but individual cases showed considerable variation from the average carbon content. The peroxide method is not deemed applicable to soils of high calcium carbonate, manganese dioxide, or chromium sesquioxide content, and it does not determine any clearly defined variety of soil organic matter. It decomposes more than the so-called humus. When supplemented by a combustion determination of the carbon in the undecomposed residues, it will probably give the most accurate value for soil organic matter in investigational work, but for routine analysis the peroxide method offers no advantages over the combustion method.

The gravimetric determination of magnesium and of phosphoric acid [trans. title], F. L. Hahn, K. Vieweg, and H. Meyer (*Ber. Deut. Chem. Gesell., 60 (1927), No. 4, pp. 971–975*).—The following two methods for the gravimetric determination of either magnesium or phosphoric acid as magnesium ammonium phosphate are based on the principle of precipitation from extreme dilutions of the interacting ions, the first procedure securing this result by the slow simultaneous addition of the phosphate and magnesium solutions to an ammoniacal ammonium salt solution and the second by precipitating in the presence of substances (tartrates or citrates) which form unstable complexes with magnesium, thereby keeping the free magnesium ion concentration at a low value throughout the precipitation reaction. Crystalline and very pure magnesium ammonium phosphate, yielding a pure white pyrophosphate in a brief ignition, is obtained by either method.

Method 1.—One hundred cc. of 2N ammonium chloride and 100 cc. of 3N ammonium hydroxide are kept just boiling in a 600- to 800-cc. beaker. The magnesium salt solution and a sodium ammonium phosphate solution of equal strength are slowly dropped in during about 30 minutes from two burettes. The heating of the stopcocks of the burettes must be avoided, and is easily prevented by the insertion of 20- to 25-cm. lengths of glass tubing between the stopcocks and the beaker. The first visible precipitate appears in about 5 minutes if about 3 cc. of magnesium sulfate solution has been dropped in. After running in both solutions, the magnesium burette is washed out three times with a total of 50 cc. of distilled water, and from the phosphate burette is introduced during from 5 to 10 minutes the same quantity as before used of the phosphate solution. One hundred cc. of 3N ammonia is then added and the precipitation left to complete itself. The magnesium ammonium phosphate is filtered off, after standing over night, through a porous porcelain crucible by suction and washed with 2N ammonia. It is then heated slowly in an electric oven and ignited to constant weight, which requires at the most 5 to 10 minutes after reaching ignition temperature.

Method 2.—Dilute the magnesium or phosphate solution to about 0.01 molar and add to each 100 cc. of this solution 0.5 gm. sodium ammonium phosphate or 0.6 gm. crystallized magnesium sulfate, together with 5 gm. ammonium bitartrate, bring the reaction mixture to water bath temperature, and add at once 40 cc. of 10 per cent ammonia at 60 to 70° C. for each 100 cc. of solution. Stir vigorously with a glass rod after about ¼ hour. After 1 hour's standing on the water bath, add a further 50 cc. of the same ammonia solution. Then allow the solution to stand over night or cool with mechanical stirring. Filter off the precipitate, wash with diluted ammonia, dry, and ignite to constant weight. If the precipitate is filtered off on paper it is advisable to wash it finally with a mixture of 3 parts of 10 per cent ammonia and 2 parts of methanol whereby a much lighter, more powdery, and whiter ignition product is obtained.

Notes giving various slight modifications of detail in the above procedure to adapt it to several special cases are appended. Numerous analyses carried out

in the presence of varying quantities of a number of alkali metal salts indicate the very satisfactory accuracy of the results obtained in either of these procedures.

The volumetric determination of phosphate and of magnesium [trans. title], F. L. HAHN and H. MEYER (*Ber. Deut. Chem. Gesell., 60 (1927), No. 4, pp. 975–977*).—When an ammoniacal phosphate solution containing ammonium salts is treated with a small quantity of 1–2–5–8 tetroxyanthraquinone and with less than the equivalent quantity of a magnesium solution, the mixture turns blue and an amorphous precipitate is formed. The precipitate usually becomes crystalline, the color at the same time turning to the original red. The change is slow when the solution stands undisturbed, is quicker on shaking, and is very rapid if the solution be vigorously stirred. The end point of the reaction is indicated by a permanent pale blue, it is very sharp, and it coincides accurately with the formation of the normal magnesium ammonium phosphate if vigorous, preferably mechanical, stirring is used. In the presence of large quantities of alkali salts mechanical stirring becomes unconditionally necessary. The following procedure is given:

For the determination of phosphate, the solution to be titrated should contain not more than 2.5 millimoles of phosphate and at the least 10 millimoles of ammonium chloride (50 millimoles does no harm if mechanical stirring is used), together with 150 millimoles of free ammonia or 10 cc. of 25 per cent solution. Add 2 cc. of an indicator prepared by grinding together 10 gm. of crystallized sodium acetate and 0.2 gm. of 1–2–5–8 tetroxyanthraquinone and dissolve the mixture in alcohol. Add with vigorous stirring 2 cc. of 0.1 molar magnesium sulfate solution, when the solution should become blue with the appearance of a slight turbidity which rather quickly shows a large separation of magnesium ammonium sulfate with a return of the original red color of the solution. Now add the magnesium solution drop-wise slowly enough so that the individual drops can be distinguished until the solution becomes permanently pale blue. The determination requires from 2 to at most 5 minutes.

The determination of magnesium is similarly carried out, a known volume of 0.1 molecular sodium ammonium phosphate in excess of that required being treated with the magnesium solution and the excess of phosphate titrated back with the magnesium sulfate solution.

Errors in analysis of alkaloids caused by presence of fatty acid or soap, H. R. WATKINS and S. PALKIN (*Jour. Assoc. Off. Agr. Chem., 10 (1927), No. 1, pp. 130–135*).—In the titration of alkaloids extracted from tablets, with methyl red as the indicator, it was found that in the presence of calcium and magnesium soaps, present originally or formed during the analysis, much of the soap may follow along with the alkaloid and appear as additional base in the titration. The removal of the fatty acids from the acidified alkaloid solution is therefore necessary, not because of low results caused by the fatty acids but because of the danger of calcium or magnesium soap formation. The following two forms of procedure are designed to avoid this difficulty:

"*Method A.*—A convenient number of the tablets (a quantity representing about 65 mg. of alkaloidal sulfate), either in the form of a finely ground powder or in the form of the tablets as such, are moistened with a little water in a small mortar (preferably glass), 1 cc. of normal sulfuric acid is added, and the whole is triturated to form a fine creamy mass. This mass is diluted further and completely transferred to a beaker, care being taken to keep the whole aqueous volume from being much over 40 or 50 cc. An equal volume of alcohol is added with stirring, and the mixture is filtered by suction, a bell-jar

arrangement with a funnel and plate being preferred, and the filtrate is collected in a 200-cc. Erlenmeyer flask. The residue is washed with a little 50 per cent alcohol. The filtrate is evaporated on the steam bath to a small volume by using an air blast. The insoluble excipient is completely transferred to the original beaker, and the process of extraction with water-alcohol mixture, filtering, and washing is repeated. This second filtrate is added to the original water-alcohol solution, and the whole is evaporated on the steam bath to about 25 or 30 cc. The cooled concentrate is then completely transferred to a separatory funnel, 2 cc. of 5N ammonia is added, and the solution is immediately extracted with chloroform in the usual way, about four extractions being made, the first with an approximately equal volume of chloroform. The chloroformic extracts are washed successively with a little water, and the combined chloroformic solutions are evaporated on the steam bath to 5 or 10 cc. (not to dryness). A quantity of N/50 acid (in slight excess) is added, and the whole is heated on the steam bath to remove the remainder of chloroform, an air blast being used preferably. The back titration is then carried out in the usual way.

"*Method B.*—If a soapy deposit is present in the titrated solution, removal of the fatty acid and subsequent reextraction of the alkaloid are carried out as follows: To the titrated solution, a few cubic centimeters of N/10 acid is added. The whole is completely transferred to a 200-cc. separator and, to remove fatty acid, extracted twice with chloroform (20 cc. and 15 cc. portions). Before being discarded the chloroformic solutions are washed once with about 10 cc. of slightly acidulated water, and the wash water is added to the main alkaloidal solution. The alkaloidal solution is then made ammoniacal and extracted with chloroform, the necessary precautions being taken against hydrolysis in the case of atropine or hyoscyamine, as already described."

Spontaneous heating of oils, N. J. THOMPSON (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 394–397, figs. 7*).—The chemical methods of iodine and oxygen absorption are considered to be valueless in the estimation of the fire hazard of spontaneously heating oils. The Mackey apparatus and method, stated to be the most generally used at present, were found to indicate a distinct fire hazard with larger samples of the cotton absorbent and oil in some cases when the method as originally described showed the same oil to be safe. The modified method uses 30 gm. of cotton waste containing 30 gm. of oil in the original Mackey apparatus as against 7 gm. of absorbent cotton, with 14 gm. of oil in the original Mackey method. Pure lard oil and denatured olive oil, which did not reach 250° F. in 4 hours in the original Mackey method, rose in the modified Mackey method here described to 350° or more in a little over 3½ hours.

An oil-jacketed apparatus, designed to be kept at a temperature 2° below that of the spontaneously heating oil at all times and to provide for tests at higher temperatures than are reached in the Mackey apparatus, is also described.

METEOROLOGY

Climatological data for the United States by sections, [January–February, 1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 14 (1927), Nos. 1, pp. [196], pls. 5, fig. 1; 2, pp. [197], pls. 5*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for January and February, 1927.

Meteorological observations, A. BISSERUP (*Virgin Islands Sta. Rpt. 1926, pp. 17, 18*).—A condensed record of monthly temperatures, precipitation, wind velocity, and evaporation at the station is given for the year ended June 30, 1926.

"The total precipitation for the year was 36.06 in., which is about 10 in. below normal and 20.07 in. less than for the preceding year. The heaviest rainfall for a 24-hour period, 3.34 in., was recorded September 22, 1925. The absolute maximum temperature for the year, 91° F., occurred July 17, 29, and 30, and August 10, and September 1, 2, 6, 7, and 8, 1925, and June 11, 16, 17, 20, and 21, 1926. The absolute minimum temperature, 61°, was recorded December 11, 1925, and March 4, 9, and 18, 1926."

SOILS—FERTILIZERS

Soil mineralogy, F. A. Burt (*New York: D. Van Nostrand Co., 1927, pp. VII+82, figs. 6*).—This is a simple introduction to the subject of soil mineralogy, including a relatively large amount of elementary mineralogical chemistry and omitting both the crystallographic and the nonsoil-forming minerals commonly treated in mineralogical texts.

Soil science for farmers, H. Puchner (*Bodenkunde für Landwirte. Stuttgart: Ferdinand Enke, 1926, 2. ed., pp. XVI+710, pls. 5, figs. 212*).—This is a revised edition essentially similar to that previously noted (E. S. R., 51, p. 510). It is a semi-technical account of the formation, composition, characteristics, and utilization of soils.

The direct determination of distribution curves of particle size in suspensions, E. M. Crowther (*Jour. Soc. Chem. Indus., Trans., 46 (1927), No. 12, pp. 105T–107T, figs. 2*).—An apparatus for securing continuous distribution curves of suspensions by measuring the time change of density at a given depth is described. It consists essentially of a highly sensitive differential liquid manometer connected between two points near the base of the sedimenting column. This affords sufficient magnification for direct readings. The apparatus is simple, easily manipulated, and easily cleaned. For details of construction and operation the drawing and original text must be consulted.

Analyses of soils of Morgan and Oconee Counties, L. M. Carter, M. W. Lowry, W. O. Collins, M. E. Brand, and G. L. Fuller (*Ga. Agr. Col. Bul. 327 (1926), pp. 36, figs. 3*).—Following a general description of the area included in these two counties, averages of from two to four analyses each show the nitrogen, phosphoric acid, potash, and calcium oxide content, together with the limestone requirement, of sandy loam, sandy clay loam, and clay loam of the Cecil series, sandy loam of the Appling series, gravelly sandy loam and gravelly sandy clay loam of the Madison series, clay loam of the Davidson series, sandy loam of the Wickham series, and fine sandy loam and silty clay loam of the Congaree series. A table of the plant food requirements of these soils and a table of the percentage composition of fine material are also included, together with general indications on the maintenance and increase of the fertility of these soils.

Soil survey of Kosciusko County, Indiana, W. E. Tharp et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+1295–1342, pl. 1, fig. 1, map 1*).—This report, prepared in cooperation with the Indiana Experiment Station, is in two parts:

I. [*Soil survey*], W. E. Tharp, E. D. Fowler, L. S. Troth, and H. R. Beyer (pp. 1295–1328).—A survey of an area of 346,240 acres in the northern part of Indiana is reported. The topography of the area ranges from level plain to undulating and rolling country, with numerous basins and depressions, and lakes and muck areas ranging from 10 to several hundred acres in extent. About 95,000 acres were reported under tile drainage in 1921.

The soils of this area have been classified as 11 series of 20 types, Miami loam 24.4 per cent, Miami sandy loam 12.6 per cent, Fox sandy loam 10.8 per

cent, and muck and peat unclassified 18.2 per cent constituting the largest portion. Swamp 0.9 per cent and gravel and clay pits 0.1 per cent are also reported.

II. *The management of Kosciusko County soils*, A. T. Wiancko and S. D. Conner (pp. 1329–1342).—General information is given on the management of Kosciusko County soils, chemical analyses and suggestions as to fertilizer needs being included.

Buffer capacity of soils and its relation to the development of soil acidity from the use of ammonium sulfate, W. H. PIERRE (*Jour. Amer. Soc. Agron., 19 (1927) No. 4, pp. 332–351*).—In this contribution from the Alabama Experiment Station, a simple and accurate laboratory method for determining the buffer capacity of soils is described, the procedure consisting essentially of a dialysis of the soil in collodion bags and the titration to a definite pH value of the clear solution thus obtained. In view of the confused terminology of this subject, it is proposed that the general buffering properties of soils be designated as buffer action, the term buffer capacity being restricted to a quantitative sense. It is further suggested in this connection that the term "buffer capacity per 1.0 pH" be designated "specific buffer capacity." Of various acids tested for the determination of buffer capacity with respect to acid, 0.1 N sulfuric was found best, results ordinarily being constant after 24 hours standing. Other acids were found somewhat slower in coming to equilibrium.

Applying this method, the buffer capacities of some sandy Coastal Plain soils were found very low, one of them having only one-fifteenth the buffer capacity of a heavy clay loam from Illinois and being only one-thirtieth as well buffered as some of the soils reported by Arrhenius (E. S. R., 48, p. 718). The buffer capacity of 14 soils toward the acidity developed by ammonium sulfate was studied in greenhouse experiments, with the result that a close parallelism was found between the amount of ammonium sulfate, calculated, on the assumption that all the nitrogen and sulfur caused soil acidity, as necessary to bring a soil to a definite H-ion concentration, and the buffer capacity of the soil toward acid as determined by the method described.

The soil reaction and the growth of the sugar cane on Java [trans. title], O. ARRHENIUS (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1927, No. 6, pp. 207–228, pls. 2, figs. 2; Eng. abs., pp. 226–228*).—There are large differences in soil activity among Java soils, these differences being due mainly to the rainfall, West Java having a humid climate, while the eastern parts of the island are arid or semiarid. It was found that soils having a pH below 6.4 gave a lower yield of sugar cane than the neutral or alkaline soils. A close relation was found between the soil pH and the calcium carbonate, potassium, and phosphoric acid content. All the Java soils below pH 7 were found deficient in calcium carbonate, and the soils having a pH below 6 showed an inadequate phosphoric acid content. It is concluded that both lack of nutrients and too high an acidity contribute to the low yields of cane on the more acid Java soils.

The effect of the constituents of alkali, fertilizers, and soil amendments on the permeability of certain fine-textured soils under irrigation, C. W. BOTKIN (*New Mexico Sta. Bul. 160 (1927), pp. 61, figs. 18*).—Neither mechanical nor chemical analyses before irrigation showed much difference between a clay loam of a very low permeability and one of fair permeability; the former contained about twice as much soluble matter. The penetration of water was retarded by 0.5 per cent of sodium and potassium compounds and by 5 per cent of clay and silt. The sodium compounds caused the greatest depression of permeability, in decreasing order as follows: Carbonate, acetate, chloride, nitrate, silicate, and sulfate. The following substances in 0.5 per cent concentrations

increased the permeability of air-dried soils, the effect decreasing in the order given: Aluminum sulfate, ferrous sulfate, aluminum chloride, (C. P.) calcium acid phosphate, ferric sulfate, potassium acid sulfate, ferric chloride, tannin, calcium acid phosphate (commercial fertilizer), manure, and ammonium sulfate. The iron and aluminum sulfate effects persisted under irrigation, the aluminum sulfate showing the greatest effect. Aluminum was not found in percolates from soils to which 1.5 per cent aluminum sulfate had been added. Permeability was greatly decreased by deflocculation, but not all compounds causing flocculation after percolation produced a corresponding increase in permeability. Deflocculation was found at pH values above 7.9 and flocculation at values below 7.5.

"Alkali in concentrations lower than required for toxicity was found to have a very depressing influence on permeability. . . . Fertilizers which tend to decrease soil-alkalinity, such as ammonium sulfate, manure, and acid phosphate, improved permeability and tilth. Sodium nitrate had an opposite effect."

Soil management studies: A three-year rotation for western Maryland, A. G. McCall (*Maryland Sta. Bul. 287 (1926), pp. 119–131, fig. 1*).—At the Frostburg field, Garrett County, a three-year rotation of potatoes, oats, and clover has for five years produced average yields per acre, without manure or fertilizers, of 158 bu. of potatoes, 46 bu. of oats, and 1.86 tons of clover hay. The application of 1,000 lbs. of acid phosphate once in the rotation, to the potato crop, increased the yields to 184 bu. of potatoes, 53 bu. of oats, and 2.62 tons of clover. Muriate of potash at 200 lbs. per acre gave practically the same yield of potatoes and of oats, but ½ ton less of clover hay. Acid phosphate and potash together gave the same yield of potatoes and oats, but less hay than acid phosphate alone. Acid phosphate and nitrate of soda also failed to show any improvement over acid phosphate alone. The value of the increase per rotation from acid phosphate alone at 1,000 lbs. per acre was $4.44 greater than from a 4–10–6 complete fertilizer at 800 lbs. per acre.

Stable manure in this rotation gave 178 bu. of potatoes, 48 bu. of oats, and 2.45 tons of clover hay. In every case the addition either of acid phosphate or of floats to the manure increased the value of the returns. The effect of the phosphate added with the manure was confined to the potatoes, no residual effect on the oats or the clover being noted. Stable manure at 20 tons per acre with 1,000 lbs. of acid phosphate increased the yield of potatoes by 51 bu., bringing the total potato yield to 209 bu. per acre. This combination increased the yield of oats by 10 bu. and that of clover hay by 1 ton.

Effect of manure, fertilizers, and lime on worn-out hay lands, F. S. Prince and T. G. Phillips (*New Hampshire Sta. Bul. 227 (1927), pp. 37, 38*).—In experiments on the treatment of exhausted hay lands, the yield on old sod without treatment was 379 lbs. per acre, and with a top-dressing of 100 lbs. of nitrate of soda 466 lbs. On reseeded land with 10 tons of manure the yield was 410 lbs.; with manure and 250 lbs. of acid phosphate 402 lbs.; with manure and 100 lbs of nitrate of soda 772 lbs.; with manure, acid phosphate, and nitrate of soda 835 lbs.; with no lime 479 lbs.; with 2 tons of lime 637 lbs.; and with 4 tons of lime 698 lbs.

Soils and fertilizers, H. J. Page (*Soc. Chem. Indus. [London], Ann. Rpts. Prog. Appl. Chem., 11 (1926), pp. 452–479*).—A survey is made of the fertilizer industry for the past year, and the year's research is summarized, 90 papers on the manufacture and utilization of fertilizers and 88 soil studies being briefly noted.

The different conditions of decomposition of manure and its phosphoric acid [trans. title], M. A. Egorov (Iegorow) (*Fosfornaiā Kislota Navoza pri*

Razlichnykh Usloviakh ego Razlozheniia. [Kharkof]: Gosud. Izdatel. Ukrain, 1925, pp. 130, figs. 20; Eng. abs., pp. 105-107).—Besides the loss of phosphoric acid from manure by leaching, preventable by proper storage conditions, a considerable loss by volatilization during rotting has been established. Storage of from one to two months resulted in phosphoric acid losses amounting to from 3.68 to 19.38 per cent of the original total, while in 2.5 years or more of storage the loss was found to reach 40 per cent of that originally present. Laboratory storage experiments indicated that manure held over water at room temperature for about 5.75 years lost 42.79 per cent of its dry matter, including 12.44 per cent of the original total phosphoric acid content, while a second sample similarly stored, but kept covered with water, not only showed no loss of phosphoric acid, but even gained slightly. The volatilization is attributed to microorganic activity.

Industry and commerce in fertilizers.—I, Nitrogenous and organic, C. PLUVINAGE (*Industrie et Commerce des Engrais.—I, Engrais Azotés et Organiques Produits Chimiques Agricoles. Paris: J.-B. Baillière & Son, 1926, 2. ed., rev., pp. 376, figs. 141*).—This is a revised edition (E. S. R., 31, p. 517) of a popular account of the preparation of nitrogenous fertilizers and of the industries concerned in their manufacture. Notes on mixed fertilizers and on some insecticides and fungicides are included.

Artificial fertilisers: Their chemistry, manufacture, and application, P. PARRISH and A. OGILVIE (*London: Ernest Benn, 1927, vol. 1, pp. 356, figs. 234*).—With the exception of chapter 1, which briefly surveys the artificial fertilizer industry in general, and chapter 12, which deals with compound fertilizers and mixing systems, the present volume is devoted to an account of the manufacture of phosphatic fertilizer materials. The treatment of bones and of basic slag is described, but the larger part of the book is concerned with the manufacture of superphosphate and double superphosphate from phosphate rock.

Mixing fertilizer on the farm, L. V. DAVIS (*Ga. Agr. Col. Bul. 328 (1927), pp. 12, fig. 1*).—Advice with regard to the choice and purchase of materials and directions for mixing these materials are given.

Farmer's handbook on the use of nitrate of soda (*London: Chilean Nitrate Com., 1926, rev. ed., pp. 80, figs. 16*).—The first one-fourth of this handbook consists of general information on the use of artificial fertilizers, including potash, phosphoric acid as superphosphate, basic slag, bone meal, and steamed bone flour, and lime, as well as nitrogen. The value of nitrate of soda in combating certain diseases which attack only the young and tender plants is noted. The remainder of the publication is devoted to the consideration of the fertilizer needs of specific crops.

Potash and borax in fertilizers, S. D. CONNER and M. J. PLICE (*Indiana Sta. Bul. 307 (1927), pp. 16, figs. 4*).—This is the final report on potash and borax experiments, begun in 1919 and noted in a preliminary report, previously recorded (E. S. R., 43, p. 325). The six years of experimental work have shown American and German potash to give equal results on corn, wheat, and oats on three different soil types. The grain yields from potassium chloride and potassium sulfate averaged the same, the quality difference of corn, if any, being in favor of the chloride. Borax was found dangerous in the row with corn at a greater rate than 0.5 lb. per acre, but when broadcast it distinctly benefited corn on two of the three soil types and did no harm on the third. Borax was found to have a harmful effect only in the early stages of growth, and then only when applied near the seed and in dry weather. Potash salts now on the market were not found to contain harmful amounts of borax.

AGRICULTURAL BOTANY

Bacteriology: A text book on fundamentals, S. THOMAS (*New York and London: McGraw-Hill Book Co., 1925, pp. XIII+201, pl. 1, figs. 12*).—This book is said to have been written to supply the author's need as a teacher for a textbook dealing with the fundamentals of bacteriology for mixed classes of undergraduate engineers, chemists, premedical students, general arts and science students, and students having had no previous training in biology.

Practical bacteriology, A. CUNNINGHAM (*Edinburgh: Oliver & Boyd, 1924, pp. VII+188, figs. 17*).—This little book is said to be intended to serve as a guide to the chief methods used in general and agricultural bacteriology. It includes exercises on some chemical changes caused by bacteria, with notes on the characteristics of important organisms. Lehmann and Neumann's classification, slightly modified, has been adopted throughout. The exercises can, in the main, be performed in reasonable time (about 300 hours in all) with comparatively simple apparatus.

The biology of legume nodule bacteria, particularly as regards specific differences [trans. title], A. MÜLLER and C. STAPP (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1926), No. 4, pp. 455–554, pls. 4*).—A systematic study of nodule bacteria in legumes furnishes a bibliography of 100 titles.

Bacterial pigments, P. LASSEUR and F. GIRARDET (*Contribution a l'Étude des Pigments Microbiens. Nancy: [Lab. Microbiol. Facult. Pharm.], [1925], pp. 75, pls. 15, fig. 1*).—This contribution to the study of bacterial pigments deals with the technique, the work, and the results obtained with *Aleurisma flavissimum*, *Bacillus chlororaphis*, *B. pyocyaneus*, *B. violaceus*, *B. prodigiosus*, *B. kiliensis*, and *B. le monnieri*, by use of both visible and invisible parts of the spectrum on a scale of wave lengths. In all, 37 spectrums are represented.

Conditions influencing sporangia formation in Blepharospora cambivora [trans. title], L. PETRI (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 259–261, pl. 1*).—Conditions favorable to the formation of sporangia by *B. cambivora* as described include constituents, concentrations, and proportions in solutions and youthfulness of the mycelium.

The significance of fungi in forest ecology [trans. title], E. ULBRICH (*Naturforscher, 1 (1925), No. 10, pp. 451–455, figs. 3; 2 (1925), Nos. 5, pp. 238–242, figs. 3; 6, pp. 286–291, figs. 3*).—A number of fungi are discussed in connection with their alleged rôles as factors in forest ecology.

Serum diagnosis as an aid to the study of relationships [trans. title], F. STEINECKE (*Naturforscher, 2 (1925), Nos. 1, pp. 1–5; 2, pp. 64–67, fig. 1*).—This presentation of serodiagnostic theory includes a graphical scheme of hypothetical relationships, indicating suggestively that of the original animals.

The auto-regulation of physiological processes in plants, R. S. INAMDAR (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), pp. 151–184, figs. 8*).—The viewpoint in this presidential address is "that what is characteristic of vital processes is neither the optimum nor a sustained maximum rate, but a specific maximum totality during physiologically equivalent periods. The tendency in the living organisation is not to exceed this specific totality when subjected to high intensities of external environment. This is achieved by an automatic regulation of the rates of numerous physical-chemical reactions taking place in heterogeneous media in the cell, resulting in varying equilibria of a complex nature. The regulation is possible only till the underlying organisation which is responsible for it is not completely destroyed, bringing down the rates suddenly to zero-line." This is put forward as a working hypothesis. Though the ground covered in the present discussion is narrower, a side light is attempted on the whole question of coordination of several physiological functions in life.

Cell stimulation, particularly as regards its agricultural and horticultural significance [trans. title], W. GLEISBERG (*Naturwissenschaften, 12* (*1924*), *No. 25, pp. 501–503*).—Experimental, theoretical, and practical phases of cell stimulation as effected with various chemical agents are discussed.

Carbohydrate alimentation in the cell, and nuclear and plastidal variations [trans. title], A. MAIGE (*Cellule, 35* (*1925*), *pp. 325–340*).—Employment of the method designated as that of nuclear variations and of the method of plastidal variations led to identical conclusions. Saccharose, maltose, lactose, glucose, levulose, galactose, mannose, and glycerin apparently serve as cell nutrients in case of bean, though it is regarded as extremely improbable that mannite is assimilable by the same cells. The literature listed ranges back as far as 1883.

Swelling of starch in living and in dead cells [trans. title], W. W. LEPESCHKIN (*Ber. Deut. Bot. Gesell., 43* (*1925*), *No. 1, pp. 16–20*).—The author has previously found that the swelling of starch in hot water involves two independent processes, first a chemical reaction between starch polysaccharides and water which leads to the formation of amylose and amylopectin, and second a swelling of the latter in water (so-called paste formation). From this report it appears probable that starch swelling in Spirogyra cells can occur only after their death, which, therefore, apparently conditions the changes above noted. Further inferences are discussed.

The dispersion of electrolytic colloids in relation to cellular exchange of mineral substances [trans. title], W. MESTREZAT and M. JANET (*Bul. Soc. Chim. Biol., 6* (*1924*), *No. 9, pp. 829–853, figs. 6*).—Experimentation is said to have shown that a close relation exists between the variable dispersion of an electrolytic colloid in a medium and the equilibrium of the mineral ions which surround it, and that the variations may bring about, between the medium in question and a second medium, exchanges of diffusible ions. Thus is thought to have been proved to exist, in the field of metabolism, an interdependence of colloids and mineral substances. Lapicque is accredited with the use, in an earlier communication than that indicated below, of the term "épictèse," defined by the present authors as the hypothesis of influence or compulsion exerted on external substances by particles of protoplasm.

Absorption of salts by plant cells: Épictèse and selection [trans. title], L. LAPICQUE (*Bul. Soc. Chim. Biol., 7* (*1925*), *No. 6, pp. 621–637*).—Discussing the use of his term "épictèse" by Mestrezat and Janet, above noted, and designating this function as a sort of pumping action of salts which remain free near the surface of the cellular medium, the present author offers his hypothesis as to the mechanism of épictèse, dealing briefly with two examples of selection embodying the cases of potassium and sodium.

Effect of previous temperature on the respiration of germinating wheat seeds, R. S. INAMDAR and BHOLA NATH SINGH (*Indian Sci. Cong. Proc.* [*Calcutta*], *12* (*1925*), *pp. 185, 186*).—As it is generally assumed that previous temperature affects respiration and assimilation in plant structures in some way, an attempt was made to determine precisely the nature of that effect. No effect was discovered when the seeds were exposed to a temperature of 25 to 30° C. (77 to 86° F.), after which the respiratory values began to fall as compared with those of the control kept at a constant temperature. Results are noted also of another worker, who claimed to find a time factor between 30 and 35°. The significance of the results is discussed from the point of view of the rapid reduction of temperature coefficients in respiration under higher temperatures noted by many observers, and a working hypothesis regarding the mechanism of respiration is put forward as consisting of more than

one independent series of reactions leading from the respirable material to the final product, carbon dioxide.

Effect of temperature on aerobic and anaerobic respirations and their ratios in the leaves of Eugenia jambolana, R. S. INAMDAR and BHOLA NATH SINGH (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 186*).—Results from work done with *E. jambolana* are said to differ from those obtained with *Artocarpus integrifolia.* The respiration values in the leaves kept in the dark were in general higher than those of the ones exposed to light, due supposedly to the accumulation of hydrolyzed products of stored material in the absence of translocation, and the anaerobic values of such leaves were lower than the anaerobic values of leaves used directly in which there was no accumulation of hydrolyzed products.

Seasonal variation in the transpiring power and the specific conductivity in Eugenia jambolana, R. S. INAMDAR and SANT SINGH VERMA (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 185*).—It is noted, as the result of investigations referred to, that the specific conductivity of wood in a number of trees was highest just before the time of leaf fall during the summer months, and that it increased later on. Simultaneous records were kept of seasonal variations in the transpiring power of the leaf tissue and the specific conductivity of the wood in *E. jambolana,* and the transpiring power of the leaf tissue was estimated by observing transpiration from surfaces without stomata under uniform conditions of environment. This method is claimed to be more accurate than the method of estimating it from relative transpiration.

The transpiring power was found to increase during the cold season and decrease during the summer, thus varying inversely as the evaporating capacity of the atmosphere. It is stated that both transpiring power of the leaf tissue and specific conductivity vary in the same directions from a maximum value before leaf fall to a minimum in September. The magnitude of variations was not, however, identical in both, and it is concluded that the variations are due to sets of causes which are entirely independent.

Hourly variations in the water content of the rapidly transpiring leaves of jasmine during the summer months, R. S. INAMDAR and BHOLA NATH SINGH (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 185*).—The water content of the rapidly transpiring leaves during the summer months varied in an inverse direction to the amount of transpiration.

Studies on the transpiration of some Australian plants, with notes on the structure of their leaves, H. W. WILSON (*Roy. Soc. Victoria, Proc., n. ser., 36 (1924), No. 2, pp. 175–237, pls. 6, figs. 8*).—This work, commenced near the beginning of 1920 and reported near the end of 1923, is presented in detail as to facts, with a bibliography of 42 titles. The main object of the work was to discover whether Australian plants, particularly the xerophytic, which in their native state are able to thrive under adverse conditions of temperature and water supply, have any special powers of accommodation, such as a regulatory decrease in transpiration, when exposed to such enormous rises in temperature and evaporation as are caused by the hot north wind.

It appears that so long as the available water supply is adequate the plants have no special powers of accommodation. Some plants have their transpiration checked when the velocity of the wind rises to about 20 miles per hour.

The so-called xerophytic plants of Australia are provided with a high average number of stomata, which enables their transpiration rate to respond quickly to changes of temperature and water supply. These plants are well protected from injurious water loss by their tough outer coverings, in some cases assisted by glands.

The water economy of plants quantitatively considered [trans. title], H. WALTER (*Naturw. u. Landw.* [*Freising*], *No. 6* (*1925*), *pp. 97, figs. 22*).—This account deals systematically with the significance of water in plant life; swelling and osmosis; the mechanism of a plant cell; plasma swelling; water relations in cell tissue; water in soil; water uptake by plants; transpiration and evaporation; water transportation; water balance; and the significance of water relations in plant life.

Relations between numbers of stomata and structure of leaves [trans. title], S. RYWOSCH (*Ber. Deut. Bot. Gesell.*, *43* (*1925*), *No. 2*, *pp. 67–76*, *fig. 1*).—Facts are detailed. The problem is not deemed a simple one. The position of the leaves on the twig must be taken into consideration in any exact study of relations between leaf stomata number and leaf structure.

Hypertrophied lenticels on the roots of cotton plants, J. TEMPLETON (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 59* (*1926*), *pp. 8*, *pls. 6*).—Hypertrophied lenticels appeared on roots of cotton plants growing in very wet soil, on dates related to irrigation, soil (nature), and water table. It is concluded as a result of experimentation that, while excessive soil moisture may result in hypertrophy of root lenticels by increasing general sap pressure, the degree of hypertrophy is determined by the supply of oxygen available to the roots.

Assimilation capability of green plastids [trans. title], W. G. ALEXANDROV (*Ber. Deut. Bot. Gesell.*, *43* (*1925*), *No. 7*, *pp. 325–332*, *figs. 2*).—The first section of this report deals with the manifoldness of the plastids in plants and the alterations of their dimensions in connection with their assimilating capability. The second deals with the influence of calcium oxalate crystals on the work of the chloroplasts.

***The pneumathodes of Cocos nucifera* L.**, S. P. AGHARKAR and J. C. BANERJEE (*Indian Sci. Cong. Proc.* [*Calcutta*], *12* (*1925*), *p. 185*).—The view that the pneumathodes are aerating organs of the root is supported.

Constitution and synthesis of natural colouring matters, R. FURNESS (*Chem. Age* [*London*], *13* (*1925*) *No. 317*, *pp. 30–33*).—In this article attention is directed chiefly to studies and results of studies in the group of chlorophyll, flavone, and anthocyanin pigments.

Fruit cast of some woody plants [trans. title], D. FEHÉR (*Ber. Deut. Bot. Gesell.*, *43* (*1925*), *No. 2*, *pp. 52–61*, *pl. 1*).—Fruit cast conditions were studied in case of *Castanea vesca*, *Fagus silvatica*, *Quercus cerris*, *Q. sessiliflora*, *Carpinus betulus*, *Juglans regia*, *Prunus padus*, *P. domestica*, *P. avium*, *P. armeniaca*, *Pyrus communis*, *P. malus*, *Populus nigra*, *Salix caprea*, *S. viminalis*, *Tilia parvifolia*, *T. grandifolia*, *Acer pseudoplatanus*, *A. platanoides*, *A. campestre*, *Ulmus montana*, *Fraxinus excelsior*, *Robinia pseudacacia*, *Gleditschia triacanthos*, *Aesculus hippocastanum*, and *Rosa canina*.

The usual separation of ripe fruits in the woody plants studied takes place as a result of secondary cell divisions which set up in a forming separation layer. The cell walls in this layer are dissolved, and this favors the separation. From two to three separation layers may function in this way. Particulars are indicated. Further related studies have been started.

Senility in plants [trans. title], L. FINARDI (*Atti Ist. Bot. R. Univ. Pavia*, *3. ser.*, *2* (*1925*), *pp. 305–353*, *pls. 2*, *fig. 1*).—Confirming statements by Benedict (E. S. R., 34, p. 222) and others, regarding evidences of aging in certain plants, the author states that in his own study plants of like ages of different species were found to show various dimensions as to vascular areas. The differences in dimension of vascular areas between leaves of younger plants and those of older plants were also found to vary according to species.

Forcing studies with prussic acid [trans. title], G. GASSNER (*Ber. Deut. Bot. Gesell.*, *43* (*1925*), *No. 3*, *pp. 132–137*, *pl. 1*, *figs. 3*).—Having observed, in

studies previously noted (E. S. R., 55, p. 519), a stimulating action of prussic acid on orange trees, the author demonstrated a forcing effect on several plants. In some cases this exceeded the forcing effect of warm water.

New apparatus for ascertaining the full and the physiologically significant sun-and-sky irradiation [trans. title], L. IWANOFF (*Ber. Deut. Bot. Gesell., 43 (1925), No. 7, pp. 315–324, fig. 1*).—An apparatus called the phytoactinometer is described which the author has devised for the study of irradiation (of different intensities and wave lengths), including that from the sky and from the sun at various elevations, particularly in connection with its effects on the physiology of plants.

GENETICS

Studies on the mutations in Oryza sativa L., I–IV, I. NAGAI (*Japan. Jour. Bot., 3 (1926), No. 2, pp. 25–96, figs. 12*).—Four studies are reported on.

I. *On staminoidal sterile and roll-leaved fertile mutants* (pp. 25–53).—The mutant form, staminoidal sterile, is awnless and completely sterile, due to staminody, and the leaves are rolled, while the roll leaf fertile form is awned, only slightly sterile, and the leaves are rolled less markedly. Both forms arose in the progenies of a hybrid between the normal-leaf awned fertile variety of normal height and a normal-leaf awned sterile dwarf. The factor for the normal type form from which these mutants arose *N* and those of roll leaf staminoidal mutant *n* and roll leaf fertile mutant *n'* constitute a multiple allelomorph. The factor *B* modifies the development of awn, acting complementary to *N* and *n'*, but is not effective with *n*.

II. *On awned sterile, compact-panicled, and dwarf mutants* (pp. 55–66).—In another type of completely sterile mutant, awned sterile, sterility is due to complete sterility of male gametes, the ovules being functional. The mutated factor is *s*, which is responsible for sterility, and the unmutated factor is *S*, complementary for the normal form. Although such caryopses observed to develop parthenocarpically attained the size of mature grain, they were devoid of endosperm and embryo, being filled with a clear liquid. The compact panicled mutant is recessive to the normal form and factors concerned are represented by *k* and *K*, respectively. Both mutants are inherited independently from the staminoidal sterile. A case of reversional production of dwarf plants from the constant roll leaf fertile plants is also described. The reverted dwarf and compact panicled mutant are both peculiar in their modes of inheritance.

III. *On paleaceous sterile mutant* (pp. 67–84).—From a single homozygous roll leaf fertile plant a completely sterile mutant, paleaceons sterile, and the normal leaf fertile mutant (reversion) have appeared in both homozygous and heterozygous conditions. Paleaceous sterile is due to the factor *g* mutated from *G*, a complementary factor for the normal form. *G* and *g* are not effective in the absence of *N* or *n'*, which is the basic factor for the development of the normally fertile or slightly sterile form. Thus the *nG* *ng* plants are alike staminoidal sterile. The genetic composition of the three forms of completely sterile mutants is expressed as follows: *N G S* normal leaf fertile; *n G S*, *n g S*, *n G s*, and *n g s*, all roll leaf staminoidal sterile (ovule sterile); *N g S* normal leaf paleaceous sterile (completely sterile); *n' g S* roll leaf paleaceous sterile (completely sterile); and *N G s* normal leaf awned sterile (pollen sterile). Two pairs of factors *Nn'* or *Nn* and *Gg* are apparently located in the same homologous chromosome pair, and usually no crossover takes place between the loci in which they are located.

IV. *On a case of partial sterility* (pp. 85–96).—The partially sterile plants arising from the normal leaf fertile plants in the progenies of a mutant family,

tudied in pedigree cultures for five generations, bred true at once but also roduced a few fertile plants. The heterozygous normal leaf plants (N n') roduced nearly twice as many partially sterile plants as the homozygous ones N N). More partially sterile plants appeared in the roll leaf plants than in ormal leaf plants.

A mutant in cotton, G. L. Kottur (*Nature [London], 119 (1927), No. 3003 . 747*).—An entirely glabrous plant with short petaled flowers and seeds with he shorter fuzz but no lint appeared in Wagale, a normally hairy Burmese ariety of *Gossypium neglectum*, that had been self-fertilized for several generations. Seeds from the aberrant plant gave rise to plants without hairs or int and with short petals.

On physiological chromomeres, H. de Vries (*Cellule, 35 (1925), pp. -17*).—"Summing up the results of this discussion, we find that each of the even haploid chromosomes of *Oenothera lamarckiana* must have at least one inkage group or one physiological chromomere in a mutable condition, while wo of them have at least two such constitutent parts, viz, *O. mut. lata* with *lbida* and *O. mut. scintillans* with *oblonga*."

Alternation of generations in relation to reduction division, N. Svedelius *Bot. Gaz., 83 (1927), No. 4, pp. 362–384*).—This contribution from the University of Upsala offers an hypothesis to explain the alternation of generation n plants.

Contributions to a knowledge of inheritance in mammals, I–III (*Carnegie nst. Wash. Pub. 337 (1926), pp. 138, pls. 14, figs. 5*).—Three papers giving the esults of investigations conducted at the Bussey Institution are included.

I. *Studies of color inheritance and of linkage in rabbits*, W. E. Castle (pp. -48).—Data relating to linkage between nine different single characters in abbits, some of which have been previously noted from other sources (E. S. R., 4, p. 29; 55, p. 524), are reported. The albino allelomorph series in rabbits, the order of dominance, consists of full color, dark chinchilla, pale chinilla, Himalayan albinism, and complete albinism, as was shown by the fact at all had the same linkage relations to the black or brown locus. The netic relations between the yellow chincilla and the Vienna-White varieties e discussed, and the lack of complete dominance in several cases was noted connection with crosses of Dutch- and Vienna-White individuals. The nes for Dutch and English are evidently very closely located in the chromome, as only 0.1 per cent of crossing over has been observed, while there is om 12 to 14 per cent of crossing over between each of these factors and ngora. The factors in the Albino series show a crossing over of 34.6±1 per nt with the black and brown genes. The nine factors agouti, black, color, tensity, Dutch, extension, English, short hair, and Vienna dealt with in this per lie in six different chromosome pairs. The sexes show no significant fferences in the rate of crossing over.

II. *Fertility and sterility in the Norway rat, Mus norvegicus*, H. W. Feldman p. 49–82).—This gives more detailed results of the experiments previously ted (E. S. R., 55, p. 482).

III. *The Japanese waltzing mouse: Its origin, heredity, and relation to the netic characters of other varieties of mice*, W. H. Gates (pp. 83–138).—A mplete account of the investigation previously noted (E. S. R., 55, p. 427) is ven, in which it is shown that the pure race of Japanese waltzing mice was ident
ly derived from the wild form *M. wagneri*. Indication also points toard a tendency for parental chromosomes to group together in interspecific osses, thus materially modifying Mendelian ratios. The interspecific hybrids hibited a marked degree of heterosis. The factor for waltzing showed no

tendency to be linked with other factors, though kinky tail was evidently definitely linked, either genetically or physiologically, with short ear.

On the occurrence of the oestrous cycle after X-ray sterilisation, Parts I–III, A. S. PARKES (*Roy. Soc. [London], Proc., Ser. B, 100 (1926), No. B 702, pp. 172–199, pls. 3; 101 (1927), Nos. B 707, pp. 71–95, pl. 1; 711, pp. 421–449, figs. 3*).—Three parts are given.

I. *Irradiation of mice at three weeks old.*—In endeavoring to throw light on the location in the ovary of the cause of the oestrous phenomena, in studies at University College, London, female mice were irradiated with X-rays at 3 weeks of age, in 2 successive doses of 40 minutes' duration. This dose caused sterility in 25 of the females, mated after the Graafian follicles were destroyed, as was shown by post-mortem in these and other animals similarly treated but killed earlier for histological study. In daily observations made on these animals for the occurrence of oestrum and for the presence of vaginal plugs, 22 were observed to have at least one oestrous period when puberty was reached, but none had oocytes, follicles, or follicular tissue present in the ovaries. The average length of the cycle was 12.7 days, which is not abnormal for mated animals, indicating the occurrence of numerous and, in many cases, regular periods of oestrum in animals devoid of oocytes and Graafian follicles, and making necessary a reconsideration of the theory of the Graafian follicles being the cause of oestrum. It is suggested that the interfollicular tissue of the ovary elaborates the oestrum-producing hormone, and that its cyclic elaborataion is due to the cyclic mechanism possessed by the normal ovary, which allows for the rhythmic maturation of follicles.

II. *Irradiation at or before birth.*—When groups of mice were sterilized with X-ray in utero and immediately after birth, irradiation during the first half of pregnancy allowed only 2 litters to be produced by 13 females, and only 2 young were raised which proved to be fertile. Very irregular results followed irradiation during the last half of the gestation period, probably because of the differences in the protection of individuals by others or by the dam, due to the uterine position. Only 1 female proved to be sterile from such treatment, while the 23 females raised of 48 irradiated immediately after birth were all sterile. However, as determined by vaginal smears, 63 heat periods occurred in these sterile females, though histological studies of the ovaries showed that they were lacking in Graafian follicles and corpora lutea with one exception.

The animals were divided into 3 groups according to the histological characteristics of the ovaries. In 1 group of 9 animals characterized by the resemblance of the ovarian tissue to lutein tissue, only 4 animals experienced even 1 oestrous period and the uteri of 4 were completely infantile. The ovaries of the other 2 groups were characterized by the vacuolated nature of the cells of the cords of the first proliferation in 1 group and by the glandular nature of these cells in the other group. Oestrum was observed in all of the females of the latter 2 groups, the average length of the cycles being 6.3 days after eliminating 4 abnormal cycles.

The results of this study show that the normal oestrous phenomena except ovulation can occur in the absence of Graafian follicles and corpora lutea. The development of the luteal-like tissue in the ovaries of certain of the animals evidently interfered with the ovarian influence on oestrum, since ovariectomized animals do not come in heat.

III. *The periodicity of oestrus after sterilisation of the adult.*—To test the effect of X-ray irradiation of mature females on the continuance of the oestrous cycle, 45 females showing regular cycles were X-rayed as in the above studies.

In prolonged examinations by the vaginal smear method of 20 females which showed an entire lack of germ cells in the ovaries on autopsies, 116 oestrous cycles, averaging 5.98±0.153 days were observed before irradiation, the individual cycles varying from 3 to 18 days in duration. After irradiation 146 cycles were observed in these individuals, which averaged 6.64±0.234 days, individual cycles ranging from 2 to 24 days in length. The 20 cycles during the irradiation period averaged 7.60 days in length. The duration of the dioestrum before and after irradiation averaged 3.64±0.104 and 4.12±0.160 days, and the duration of the oestrum 2.35±0.051 and 2.52±0.069, respectively. It was concluded that the X-ray treatment had no significant effect on the duration of the whole cycle or of the dioestrous or oestrous periods, but the variation of the cycles after irradiation was somewhat greater due to a greater variability in the duration of the dioestrous interval. No significant differences were observed in the length of the successive cycles occurring after irradiation.

In another portion of the work 9 females were mated at various intervals, and it was found that 4 became pregnant at 2, 4, 6, and 7 days, respectively, after X-raying, though only 2 produced normal sized litters, as 1 produced a litter of 1 and another reabsorbed the fetuses. Further tests indicated that corpora lutea of lactation had been formed in at least 1 female of this group, though on later examination her ovaries proved to be devoid of oocytes and follicles.

Some differences were observed in the histological changes in the ovary resulting from the sterilization before and after puberty. Irradiation in the former case resulted in complete destruction of the follicles with a proliferation of the germinal epithelium, forming new tissues in the ovary, while in the latter case the tissues of the sterilized ovary came from follicular and interfollicular material.

Changes in the ovary of the mouse following exposure to X-rays, Parts II, III (*Roy. Soc. [London], Proc. Ser. B, 101 (1927), Nos. B 707, pp. 95–114, pls. 3; 710, pp. 316–328, pls. 2, figs. 4*).—A continuation of the studies of the changes in the ovaries of mice following X-ray exposure (E. S. R., 57, p. 30).

II. *Irradiation at or before birth*, F. W. R. Brambell, A. S. Parkes, and U. Fielding.—Discussions are given of the histological structures of the ovaries of the mice X-rayed just before and just after birth. The study showed that two successive proliferations from the germinal epithelium in the form of cords follow the degeneration of the oocytes and follicles resulting from X-ray exposure. Cysts or corpora lutea atretica, which may result from the degenerating follicles, frequently persist indefinitely but have no effect on the oestrous cycle. The separation of the animals into groups according to the appearance of the ovaries is described in somewhat more detail than in the preceding paper, and it is concluded that the production of oestrin and the regulation of the oestrous cycle are mainly due to the cells of the first proliferation. Oestrin production appears to stop when the luteal-like cells reach a certain stage.

III. *Irradiation of the non-parous adult*, F. W. R. Brambell and A. S. Parkes.—The changes in the structure of the ovaries are described in 44 mice which were X-rayed after several oestrous cycles had been observed. The oestrous histories of these animals before and after irradiation, as discussed by Parkes, are noted above.

The histological studies showed that 75 per cent of the animals killed over five weeks after irradiation were sterile. Proliferation from the germinal epithelium was not observed as in animals irradiated before puberty. The elements of the follicles and interfollicular tissue persisted and formed the tissues of the sterilized ovary. The degeneration of the oocytes and growth of the membrana

granulosa cells immediately after irradiation formed the so-called anovular follicles, which are identical with the cords of the second proliferation from the germinal epithelium in animals X-rayed before puberty.

Pollen sterility in reciprocally differing Epilobium hybrids [trans. title], M. OBERBEUTER (*Ber. Deut. Bot. Gesell., 43 (1925), No. 2, pp. 47–51, pl. 1*).—Pollen sterility is very differently expressed in the reciprocal crossings between *E. parviflorum* on the one hand and *E. montanum* and *E. roseum* on the other. The ways are indicated, with comments.

[Experimental variation in hyacinth, narcissus, and tulip], W. E. DE MOL (*Genetica [The Hague], 7 (1925), No. 1–2, pp. 111–118; Eng. abs., pp. 117, 118*).—It is stated that the use of X-rays and tar oils caused no certain hereditarily constant variation of the somatic nuclei in diploid and heteroploid varieties of *Hyacinthus orientalis*, but only a slackening in growth and weakening of the experimental plants.

The elimination of false wild oats: A breeding possibility, C. L. HUSKINS (*Sci. Agr., 7 (1927), No. 8, pp. 285, 286*).—From extended studies on the occurrence of fatuoids (E. S. R., 57, p. 32) in cultivated oats, the author suggests the working hypothesis that ordinary practically awnless varieties of oats and weakly awned ones contain hypostatic factors for strong awning and the fatuoid complex, but that some or all completely awnless strains are entirely free from these factors and so can not produce fatuoids except by crossing with them.

The factorial interpretation of sex-determination, L. W. SHARP (*Cellule, 35 (1925), pp. 193–235, figs. 6*).—This paper is intended "neither as an exhaustive analysis of sexuality, of whose essential nature so little is known, nor as a criticism of the voluminous literature on the subject, but is offered rather in the hope that it may aid in bringing about a better mutual understanding between those whose fundamental concepts probably do not differ so widely as their language might lead them to suspect."

The author reviews representative researches bearing on the problem of sex determination in plants, then outlines certain basic principles involved in the theory of Mendelian heredity and inquires into the applicability of these principles to the phenomena of sex, and considers finally several types of life cycles in the light of the conclusions which appear valid. Although the discussion is limited almost wholly to plants, nothing is seen to indicate that the conclusions are not equally valid for animals. A note on terminology is appended. Liberal citations to related literature extend as far back as 1906.

FIELD CROPS

[Agronomic work in Hawaii, 1926], H. L. CHUNG and J. C. RIPPERTON (*Hawaii Sta. Rpt. 1926, pp. 11, 12, 13, 14, 15–19, figs. 8*).—Experimental activities (E. S. R., 55, p. 526) reported on briefly included studies of varieties of potatoes and taro, sweet potato seedlings, and corn hybrids. Investigations with edible canna were concerned with growth and seed studies, cultural tests, varietal comparisons, mill control methods, factors affecting properties of the starch, mineral constituents of the crop, and possibilities of the pulp as a feed. Data on the carbohydrate metabolism of the canna plant are reported on page 329.

[Agronomic investigations in the Virgin Islands, 1926], J. B. THOMPSON, W. M. PERRY, and M. S. BAKER (*Virgin Islands Sta. Rpt. 1926, pp. 4, 5, 8, 9, 10–13*).—Continued field crops experiments (E. S. R., 55, p. 333) reported on embraced breeding work with sweet potatoes, variety tests with yams and sugar cane, and a production test with *Canna edulis*.

Seedling S. C. 22/21, a green sugar cane resembling its parent, S. C. 12/4, ranked high in content and acre yields of sucrose, is drought resistant, and is an early maturing, hardy cane. A relatively large proportion of new seedlings derived from S. C. 12/4 were thrifty and grew well, whereas Ribbon seedlings were weak and unpromising. In germinating seedlings the greatest success followed the planting of seed from arrows collected the last week in December and the first week in January. The method giving best germination results is outlined. B. 376, B. H. 10 (12), and S. C. 22/31 led in acre yields and contents of sucrose.

The use of a paper mulch has promoted tillering and increased plant growth, but the increase in cost of production compared with the value of the yield increase hardly recommends the practice for the Virgin Islands. Cane on land plowed and harrowed in February and cultivated at intervals to control weeds and maintain tilth cost about 7 per cent more per unit area than cane on land remaining unplowed until planting in November. However, the fallowed land made an increase of over 57 per cent in cane yields. Planting on level land was superior to planting in furrows between banks, and cuttings laid horizontally in furrows and covered with soil gave better results than those planted obliquely in holes made with a pickax or crowbar. Close plantings, 2 ft. apart in 3-ft. rows, made the highest yields in spacing tests.

Emergency crops for flooded lands in the Mississippi Valley, J. A. Evans (*U. S. Dept. Agr., Misc. Circ. 106 (1927), pp. 8*).—This revision of the circular by Knapp (E. S. R., 27, p. 337) is designed to aid farmers in districts inundated by the floods of 1927, and gives general suggestions for growing and utilizing emergency field and garden crops after the waters recede.

Further studies in the formation of permanent pastures in North Wales, R. A. Roberts (*Welsh Jour. Agr., 3 (1927), pp. 84–99*).—Additional data and observations are presented, supplementing those already recorded (E. S. R., 55, p. 834).

Characters which determine the economic value of grasses, I–IV, R. G. Stapledon (*Jour. Min. Agr. [Gt. Brit.], 33 (1927), No. 12, pp. 1083–1091; 34 (1927), Nos. 1, pp. 11–19; 2, pp. 146–154; 3, pp. 251–258*).—Nutritive value, palatability, and ratio of leaf to stem, tiller production, powers of resistance to repeated defoliation, and persistency and aggressiveness are discussed as important factors influencing the economic value of grasses.

Strength of culms of cereals as affected by fertilizers and other factors [trans. title], P. Stuch (*Ztschr. Pflanzenernähr. u. Düngung, 7 (1926), No. 5–6, Wiss., pp. 257–290, figs. 3*).—Morphological and anatomical studies were made on the culms of oats grown in field plats and of barley, wheat, and potatoes in pots, all receiving fertilizer varying in nitrogen, phosphorus, and potassium. The oats also received different nitrogen salts.

An optimum supply of nitrogen resulted in strongly developed culms which favored strength of straw, whereas heavy nitrogen applications produced thin cell walls and lax tissues and reduced culm strength. Excessive nitrogenous fertilization seemed to increase susceptibility to mildew, which also rendered the straw liable to lodging. Heavy phosphorus applications favored strength of straw in all tests, the cell walls being thicker and the culm walls extended. The mechanical tissues developed sooner, and increased pressure and tension could be withstood. However, the favorable effects from phosphorus fertilizers appeared to be occasionally offset by increased susceptibility to mildew. The use of potassium seemed to result in increased strength of straw and resistance to mildew.

Alfalfa seed made permeable by heat, A. M. LUTE (*Science, 65 (1927), No. 1676, p. 166*).—Application of moderate heat greatly increased the percentage of permeable alfalfa seed (E. S. R., 56, p. 820) at the Colorado Experiment Station without appreciable reduction in the percentage of live seed. The best results have been obtained at 75° C. (167° F.) for periods varying from 3 to 6.5 hours. Tests of heated seeds after 5 months' storage showed no loss of vitality.

Effect of reaction of solution on growth of alfalfa, A. R. C. HAAS (*Bot. Gaz., 83 (1927), No. 2, pp. 207-211, figs. 3*).—When alfalfa was grown in modifications of Hoagland's solution at the California Citrus Experiment Station neither approximate neutrality nor moderate alkalinity appeared unfavorable to growth. The average growth was least at pH 5 and greatest at about pH 8.

Fourth report on the experiments on the influence of soil, season, and manuring on the quality and growth of barley, 1925, E. J. RUSSELL (*Jour. Inst. Brewing, 33 (1927), No. 3, pp. 104-110*).—In continued experiments (E. S. R., 54, p. 733) carried on at 11 centers in England, 1 cwt. of ammonium sulfate increased the average yield per acre of dressed barley grain 7.1 bu., whether phosphorus and potassium were added or not. Phosphates had a much more pronounced effect on yield than potash, but neither affected grain quality much. Nitrogenous fertilizers, however applied, almost always raised the percentage of nitrogen in the grain. The lowest nitrogen content was in barleys grown on the unmanured plats or with potassium and phosphatic fertilizers only. The influence of fertilizer on 1,000 kernel weight was small and not always in the same direction. Sulfate of ammonia alone either increased the weight or left it unaltered. Phosphate or potash added thereto usually reduced the weight, but the weight was not consistently reduced when both were given. Ammonium chloride again proved superior to ammonium sulfate in valuation of the barley.

Fourth report of the influence of soil, season, and manuring on the quality and growth of barley of the 1925 crop as indicated by the malts made therefrom, H. M. LANCASTER (*Jour. Inst. Brewing, 33 (1927), No. 3, pp. 111-119*).—Malting tests (E. S. R., 54, p. 734) by Lancaster and analyses by H. L. Hind are tabulated for the barleys from the experiments reported above.

The selection of Burma beans (Phaseolus lunatus) for low prussic acid content, J. CHARLTON (*India Dept. Agr. Mem., Chem. Ser., 9 (1926), No. 1, pp. 36, figs. 2*).—Interference of environmental factors seemed to prevent continuous reduction of the HCN content of Burma beans by single plant selection. The quantities of HCN in and the activity of the hydrolytic enzyme of Burma beans appeared to depend on age of sample and storage method. Fairly heavy liming or soil variation did not significantly affect the HCN content of the beans, seasonal conditions considerably outweighing other causes of variation.

The HCN synthesized in stored beans in the hot, humid season is all or partly destroyed during the subsequent cold season. The portion of the HCN extractable by hot water (glucosidal HCN) is highest in the first year of storage, afterwards becoming very small in good samples of beans. After storage for one year the total and autoenzyme HCN exceed the glucosidal HCN and remain so during the second and third year of storage, i. e., the total duration of the storage tests. The actual variation in HCN contained in Burma beans was considerable. Comparative inactivity of the hydrolytic enzymes or enzyme at harvest is common to other varieties of *P. lunatus*, and other sorts of *P. lunatus* may contain as much HCN as Burma beans. Methods of determining the HCN content are commented on.

Carbohydrate metabolism and its relation to growth in the edible canna, J. C. RIPPERTON (*Hawaii Sta. Bul. 56* (*1927*), *pp. 35, figs. 17*).—In field and laboratory experiments made to study continuously the growth of edible canna (*Canna edulis*) and the occurrence of sugars and their changes during translocation and ultimate storage as starch in the plant, sucrose was found to be the chief sugar of the leaves. The hexoses are present in only very small quantities, and the hexose-sucrose ratio is always very low, in leaves from an old mature plant as well as from a young, rapidly growing plant. The sucrose percentage is lower in the midribs and the sheaths than in the leaves, whereas that of the hexoses is much higher. In the stem proper much more of the hexoses are present than of sucrose. In the apical part of the rootstock, as compared with the stem, the sucrose increases and the hexoses correspondingly decrease. In the basal part of the rootstock both sugars usually decrease, especially the hexoses. The hexoses seem to be the chief sugars of translocation and the starch in the rootstocks to be formed from sucrose rather than from the hexoses.

Study of plants in different maturity stages showed that the quantity of hexoses is much less in immature than in mature stems, due to the diversion of the flow in the former to the apical growth of the plant, indicating the value of the mature stem in the synthesis of food material. The sucrose content of the rootstocks varied similarly to the hexoses of the stem. Young and vigorously growing rootstocks are characterized by a high percentage of the hexoses which occasionally exceed the sucrose, whereas in the more mature rootstocks the hexoses are consistently low in quantity, indicating their association with the growing parts thereof. The concentrations of the hexoses in the stem and of sucrose in the rootstock would seem to be good indicators of the rate of transposition of sugars and their ultimate storage as starch in the rootstock.

The sucrose content of the rootstock, especially when immature, is lowered when normal growth ceases for a protracted period, a return of favorable growing conditions often failing to cause any increase therein. This fact and the low starch content of the rootstock indicate a loss of amylogenic power. Abundant irrigation of stunted plants may result in an increase of sucrose in the rootstock, but the increase seems due to the process of germination or hydrolysis of the starch already stored in the rootstock to support secondary growth development. In the mature rootstock the sucrose content varies greatly under different conditions. It may exist in some sort of equilibrium with the starch, since the sucrose content is low in rootstocks having a low starch content and high in those high in starch. When stem growth has not been injured during the dormant period new growth with rootstocks of fairly good size is produced, whereas stunted stems produce extremely stunted rootstocks.

The percentage of starch varies widely in canna rootstocks of different stages of maturity. Low in the very young rootstock, the starch content increases up to the dormant stage of the rootstock, with a concurrent increase in specific gravity. Although the growth curve of different hills varies somewhat, the correlation between specific gravity and the percentage of starch is general. A table included makes possible the determination of the approximate percentage of starch in a rootstock from its specific gravity. Determination of osmotic pressures by cryoscopic measurements on a few plants confirmed the general conclusions regarding growth drawn from the carbohydrate metabolism study.

Clover problems, R. D. WILLIAMS (*Welsh Jour. Agr., 3* (*1927*), *pp. 108–118, figs. 2*).—When English broad red and Montgomery, early and late varieties of red clover, were seeded in alternate plats comprising 3 1-ft. drills each, reduced

yields resulted in the late and increased yields in the early variety, probably due to the shading effect of the latter. However, the increase of the one practically compensated for the loss of the other.

Early cutting of Montgomery clover resulted in a reduced hay yield and in an increased yield of aftermath. Reduced yields followed very early and delayed cuttings. Analyses showed that hay from early plats was much higher in nutritive value than that from plats cut 2 or 4 weeks later. The best time of cutting crops consisting largely of Montgomery red clover for hay seemed to be during the last week in June or the first week in July.

Growing clover seed in Idaho, A. E. McClymonds and H. W. Hulbert (*Idaho Sta. Bul. 148 (1927), pp. 24, figs. 4*).—Cultural and field methods and management and harvesting practice are outlined for growing red clover, alsike, white clover, and Ladino clover for seed in Idaho, comment being made on the extent of the industry, foreign seed, varieties, weeds, and diseases. Insects affecting clover seed production are discussed by C. Wakeland. Data showing the superiority of Idaho strains of red clover over imported strains are also included.

Sea-island and Meade cotton in the southeastern States, O. F. Cook and C. B. Doyle (*U. S. Dept. Agr., Dept. Circ. 414 (1927), pp. 20, fig. 1*).—Calling attention to the factors to be considered in attempts to produce sea island cotton or other extra long staple cottons in the Atlantic coast districts of South Carolina, Georgia, and Florida, this circular indicates the lack of seed supplies and restriction of importation, conditions favorable to long staples, and market problems, and relates the advantages of a standardized product and of community organization of production. The fruiting habits and comparative susceptibility to boll weevil of sea island and upland cottons are described, with brief reports of production tests with and comparative yields of sea island and Meade cottons in the southeastern States.

Reports [on cotton investigations] received from experiment station, 1925–26 (*London: Empire Cotton Growing Corp., 1927, pp. 234, pls. 15, figs. 18*).—Investigations with cotton (E. S. R., 54, p. 637) conducted under the auspices of or by officials variously connected with the Empire Cotton Growing Corporation are reported on from Biloela, Queensland; Barberton and Candover, South Africa; Bremersdorp, Swaziland; Gatooma, Southern Rhodesia; Anglo-Egyptian Sudan; Serere, Uganda; Makwapala, Nyasaland; Daudawa, Northern Nigeria; and St. Vincent, British West Indies. Work on St. Vincent reported by Burd (E. S. R., 54, p. 830) dealt with spacing and varietal tests with sea island cotton, inheritance of corolla color (E. S. R., 55, p. 429), petal length, weight and length of lint and seed weight, rogues (E. S. R., 51, p. 29), plant development and crop analysis, and pure strains.

[Potato experiments in New Hampshire] (*New Hampshire Sta. Bul. 227, pp. 14–17*).—In tests by O. Butler, seed cut from the bud end of potatoes and planted at once yielded 402 bu. per acre and when planted after 8 days 324 bu., while that from the stem ends gave 394 and 167 bu., respectively. When similar seed was planted at once, and after 3 and 5 days, the bud ends of the tubers, while showing the effects of adverse storage conditions, were again very much less affected than the stem ends. The use of sulfur as a drier was decidedly beneficial in the case of the seed held 5 days, but no advantage accrued from its use on seed planted at once or after standing 3 days. Comparisons of "firsts" and "seconds" of certified seed suggested that small seed planted whole produced stock somewhat freer from mosaic and leaf roll than did standard size cut seed.

Fertilizer tests by F. W. Taylor wherein the potash was varied gave indications that where stable manure is used in medium applications the supplementary fertilizer need not contain more than 4 to 6 per cent of potash. When 1,800 lbs. per acre of 4-8-4 fertilizer was applied above the seed, potatoes averaged 213 bu. per acre, below the seed 215, beside the seed 226, and with the seed 230 bu. Where unfertilized potatoes averaged 166 bu., those receiving 12 tons of manure 198, and 24 tons 230 bu., the price of $1.65 per bushel made each of the first 12 tons of manure worth $4.43 and of the second 12 tons $4.80 without considering the residual effect of the manure.

Effect of fertilizer on potato tubers, B. E. Brown (*Amer. Potato Jour., 4 (1927), No. 4, pp. 37, 38*).—When potatoes, wet or dry, were stored in contact with or without fertilizer in wet or dry bags they were injured most by the combination of wet tubers, contact with fertilizer, and wet bags. Wet tubers rolled in fertilizer and stored in dry bags also suffered considerably. The results indicate the need of cleaning fertilizer bags thoroughly before storing potatoes in them.

Potato growing in Kentucky, J. S. Gardner and C. W. Mathews (*Ky. Agr. Col. Ext. Circ. 202 (1926), pp. 38, figs. 20*).—The practical information outlined for Kentucky conditions deals with potato varieties and seed, cultural and field practices, harvesting methods, and disease and insect control.

Better potatoes for Michigan, H. C. Moore (*Mich. Agr. Col. Ext. Bul. 49 (1927), pp. 12, figs. 6*).—Factors and practices considered essential in the production of better potatoes and higher yields are described.

Hereditary and environmental factors that produce mottling in soy beans, F. V. Owen (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 559–587, pl. 1, figs. 4*).—Investigation at the Wisconsin Experiment Station showed that environmental factors as well as heredity play an important part in the mottling of soy beans. All varieties of the soy bean with yellow or green seed studied proved subject to mottling. See also an earlier note (E. S. R., 56, p. 733).

Consideration of the distribution of mottled seed on the plant and within the pod, abnormal physiological conditions, nutrients, soil types, spacing, inoculation, and shading gave evidence that environment affects the production of mottling, and also that a delicate nutritional balance exists which likewise influences mottling. During efforts to select for and against mottling, certain selections consistently produced less mottling than others, but badly mottled seed has been produced from selections where mottling was least expected by supplying environmental conditions favorable for the formation of pigment in the seed coat. Genetic analyses to be published later dealt with seed coat color in the soy bean.

The black and brown pigments responsible for mottling were found to be glucosides, and an explanation of their production by means of an accumulation of sugars has been considered. The most striking evidence for this theory was obtained from the observation that mottling was greatly increased by reviving the growth of the plant after the seeds were practically mature.

The sugar beet variety test [trans. title] (*Ztschr. Ver. Deut. Zuckerindus., No. 845 (1927), pp. 122–136, figs. 7*).—A discussion of the plat technique, apparatus, analyses, and interpretation of results in varietal comparisons with sugar beets.

Variety tests of sugar cane at the Sugar Experiment Station, W. G. Taggart (*Louisiana Stas. Bul. 199 (1927), pp. 39*).—Tables show analyses and susceptibility to mosaic for sugar cane seedlings derived from Java material by the U. S. Department of Agriculture and grown under the designation of

U. S. seedlings and Canal Point seedlings. The diameters, tillering, and habit of the latter group are indicated. Other data relate to the analyses and sugar and cane yields of certain P. O. J. seedlings, effect of storm damage thereon, the behavior of Java seedlings in comparison with D–74 and Louisiana Purple on local test fields, and the analyses and yields of 13 varieties of general interest.

Sugarcane breeding: Indications of inheritance, T. S. VENKATRAMAN (*India Dept. Agr. Mem., Bot. Ser., 14 (1927), No. 3, pp. 112–129, pls. 6*).—Observations recorded at the Imperial Sugarcane Breeding Station at Coimbatore are indicative of the inheritance of and influence of the pollinating parent on vigor of growth; habit of plant (erect or depressed); tillering; width, tips, color of sheath, and ligular process of leaves; diameter, length, joint shape, ivory markings, splits, and hairs of stalk; depth, penetration, resistance to waterlogging, and other characters of the root; juice quality; and susceptibility to smut.

The life history of timothy, M. W. EVANS (*U. S. Dept. Agr. Bul. 1450 (1927), pp. 56, pls. 12, figs. 7*).—The life history of timothy (*Phleum pratense*) recorded in some detail under the topics of growth of the timothy plant, the shoot, the roots, the haplocorm, the leaves, the inflorescence, and the effect of length of day on growth of timothy is based on data obtained in extensive studies from 1912 to 1924 at the timothy breeding field station in Ohio.

Experiments with timothy, R. NEWTON and J. FICHT (*Alberta Univ., Col. Agr. Research Bul. 3 (1926), pp. 87, figs. 8*).—Investigations with timothy at the University of Alberta, considered with results obtained elsewhere, dealt with varieties, the suitability of timothy and management for hay production, seed production, and the hull-less seed problem.

Varietal trials showed Swallow [Svalöf 523] to be outstanding in yields. Largely because of lack of drought resistance, timothy has not proved so well adapted to most sections of western Canada as western rye and brome grass. Timothy may be profitably grown on irrigated lands, low moist lands, and drained areas. Poor yields sometimes given by crops after timothy in rotation, apparently caused by temporary depression in the supply of available soil nitrogen, may be largely avoided if the timothy is not continued too long and the sod is so broken as to induce rapid decomposition. Legume hay crops seem better than grasses for soil fertility, but the latter are needed to restore soil fiber and prevent soil drifting.

The better yields usually obtained by seeding alone did not appear to compensate for the loss of a nurse crop. Stands should not remain longer than 3 or 4 years. Seeding tests indicated the use of 8 lbs. of seed in 6-in. drills or 10 lbs. broadcast for hay. Timothy may be properly sown in 30- or 36-in. rows for seed.

Hull-less (naked) seed lost their viability and vigor of germination more rapidly than hulled (covered) seed in both the laboratory and field. However, the superiority of hulled seed over hull-less seed for hay was not significant. The percentage of hull-less seed seemed less a function of inherent differences in the strains than of incidental differences in environment and handling. Practices found by experiment to reduce the percentage of hull-less seed include cutting the crop when slightly immature, curing thoroughly in the open before storing under cover, threshing when the crop has been slightly remoistened by dew or rain, and adjusting the thresher cylinder to run at a speed about three-fourths normal, and opening the concaves as far as possible consistent with complete threshing.

Report of Tobacco Station at Windsor, 1926, P. J. ANDERSON and N. T. NELSON (*Connecticut State Sta., Tobacco Substa. Bul. 8 (1927), pp. 25-58, pls. 3, figs. 3*).—In continued fertilizer tests (E. S. R., 55, p. 223) the only adverse effect resulting from increasing the sodium nitrate in the formula was a slight reduction in yield about offsetting the saving in cost. Ammonium sulfate maintained the yield but produced tobacco poor in quality and burn. No harm apparently accrued from supplying one-fifth of the nitrogen as sodium nitrate, and no advantage came from supplying it all from organic carriers. The fire-holding capacity was considerably lower, and the ash was not so white in tobacco from plats treated with dry-ground fish. Tobacco from plats receiving tankage, except for a somewhat darker ash, equaled or surpassed that from plats receiving one-fifth the nitrogen from sodium nitrate. Tankage is suggested to replace cottonseed meal when the latter is high in cost. No indications of harm were apparent when synthetic urea supplied part of the nitrogen.

Comparison of potassium-magnesium sulfate with high-grade potassium sulfate showed that unless sand drown is troublesome on the field there is apparently no advantage, and, indeed, certain disadvantages in the use of potassium-magnesium sulfate. Substitution of potassium chloride for a combination of potassium sulfate and carbonate did not affect the yield, whereas there has been a material lowering of the grade index, the percentage of dark grades being increased by the chloride. Burn tests revealed that potassium chloride evidently had a very serious effect in curtailing fire-holding capacity, this being confirmed by tests elsewhere. In this regard see also a review by Jenkins (E. S. R., 56, p. 423). The use of potassium chloride is neither advised for tobacco nor for crops preceding tobacco. In a comparison of potassium carbonate and potassium nitrate with potassium sulfate there was no serious root rot infection on any plat, nor was there appreciable decrease in soil acidity. During burn tests, cigars made from tobacco treated with potassium nitrate did not sputter or crackle.

Brown, Crafts, Duncan, and Peckham have been outstanding among Havana seed strains, the experiments indicating that certain strains in the Havana seed type are inherently better than others and that this superiority may be depended on to remain relatively constant under varying conditions of culture, weather, and soil. Certain root rot resistant strains have outyielded other sorts, although they were not free from defects. The merits of different Broadleaf strains are pointed out.

A brief report on Relation of Soil Reaction to Black Rootrot and Good Tobacco, by M. F. Morgan and Anderson, shows that for shade tobacco at least the safety point is near pH 5.6. Broadleaf is more resistant and grows a good crop where shade is moderately affected. Few places were found where the soil was too acid for growth. A new method for determining soil acidity, developed by Morgan, is outlined.

In an account entitled *Preservative Treatments for Tobacco Shade Cloth*, H. P. Holman and T. D. Jarrell describe experiments previously noted (E. S. R., 57, p. 297).

According to a report on Tobacco Insects in 1926, by W. E. Britton and Anderson, it appeared that the loss from wireworms may be very materially reduced but not entirely eliminated with cyanogas. The use of tobacco plants as baits and the prevalence of grasshoppers are commented on. Brief accounts on Tobacco Diseases Observed in 1926, by G. P. Clinton and Anderson, and The Heber Process of Sweating Tobacco, by Anderson, are also included.

The phosphorus requirements of old tobacco soils, P. J. ANDERSON, M. F. MORGAN, and N. T. NELSON (*Connecticut State Sta., Tobacco Substa. Bul. 7*

(*1927*), *pp. 24, figs. 2*).—Plat experiments during 5 years on old tobacco land at Windsor, Conn., revealed that, contrary to tobacco fertilizer tests elsewhere in the country, tobacco was indifferent to the quantity of phosphorus in the fertilizer, no significant difference being observed in the yield, quality, or burn. The lack of response to phosphorus in Connecticut soils is held due to the great surplus accumulating by long-continued heavy applications of phosphates. Additional phosphorus added to old tobacco soils was not taken up by the plant, and no secondary benefits from phosphorus were observed. Special carriers of phosphorus could probably be omitted from the fertilizer mixture for an indefinite period without harm to the tobacco crop on fields where tobacco has been grown continuously, whereas on new fields never or not recently in tobacco considerable phosphorus should be applied in the fertilizer, about 160 lbs. of phosphoric acid per acre being suggested.

The germination of green manure seeds, T. H. Holland (*Ceylon Dept. Agr. Yearbook, 1927, p. 59*).—Soaking in hot water hastened germination of *Vigna oligosperma*, *Leucaena glauca*, *Tephrosia candida*, *T. hookeriana*, and *Centrosema pubescens* and increased the total germination of the first two, whereas soaking in cold water did not improve germination.

Eradication of weeds in cereals, L. Roy (*La Destruction des Mauvaises Herbes . . . dans les Céréales. Besançon: La Solidarité, 1925, pp. 91, pls. 4, figs. 14*).—The principal weeds infesting cereals in France are described, and their control by means of sulfuric acid, solutions of common salt, and other methods is outlined. The action of the herbicides on the weeds, crops, and soil is discussed briefly.

HORTICULTURE

[Horticultural investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 227, pp. 11, 12, 18–35*).—This report as usual (E. S. R., 55, p. 833) contains comprehensive statements upon the progress of various investigations.

As reported by F. S. Prince and J. R. Hepler, manure plus commercial fertilizer was more effective in increasing yields of sweet corn than were larger applications of manure used alone. The lowest yield was obtained on a plat receiving commercial material and the maximum yield on a plat receiving manure and a moderate amount of complete fertilizer.

Records taken by G. F. Potter and S. W. Wentworth in the Woodman Baldwin orchard showed the highest yield per tree in 1926 in the plat which received extra nitrogen in addition to complete fertilizer. This plat has had the highest average yield for the last 8 years. Twig growth and fruit size were unusually variable due to a dry summer. The regular bearing of the trees on the plat receiving added nitrogen is believed due to a greater annual production of new spurs and their greater tendency to fruit the second season. The fruiting was, however, in a large measure on different small branches in successive years. Samples of nonbearing spurs collected about July and one month later by Potter and T. G. Phillips from Baldwin trees representing a great variety of environmental conditions were analyzed with the object of checking up their chemical composition with the blossoming behavior the succeeding spring of comparable spurs. Nitrate of soda applied in August as a supplement to spring treatment failed to affect appreciably the percentage of spurs blossoming the next spring or the size of the resulting fruit. The average yield of the twice nitrated trees was, however, approximately one-third larger than that of the trees receiving a single treatment.

Data taken on Northern Spy and McIntosh trees pruned to different systems showed the greatest diameter gain in the semileader lot. Poor growth recorded for unpruned trees is thought due to a poor location. Nitrogen increased the yield and growth of peach trees, but no evidence was secured as in the preceding year to indicate that the addition of potash to nitrogen further increased yield or growth. Observations upon the importance of the Baldwin and McIntosh apples were again made by Potter (E. S. R., 55, p. 645), and pears and plum varieties are discussed by L. P. Latimer.

The average yield of Howard 17 strawberries fertilized with manure and nitrate of soda was distinctly less than that secured with manure alone. The average decrease amounted to about 32 per cent, with the greater part, 46 per cent, in the last half of the season. Observations on a plantation of Howard 17 strawberries set in the spring of 1926 in the permanent garden soil-fertility plats showed no positive effect of lime upon plant survival. The highest survival was recorded on the plat receiving manure alone and the lowest on plats in which manure was supplemented with chemicals. In respect to the average number of progeny plants per mother plant there was some indication that chemicals had a deleterious influence. In the case of manured plats the number of progeny plants was almost proportional to the amount of manure applied. Conflicting results were secured on the green manure plats.

Records taken upon a large number of tomatoes again showed that only the early and second early varieties are adapted to New Hampshire. Observations made on several tomato varieties to determine whether early maturity is due to early blossoming or to hastening of the ripening period suggested that both factors are involved, the early types growing more rapidly early in the season and also requiring less time for maturing their fruits.

Records taken of the yield and the time of ripening of Danish Ballhead cabbage receiving different amounts of acid phosphate in addition to a basic manure treatment showed a beneficial effect of phosphoric acid upon yield and early maturity, but in no measure comparable to the results with tomatoes. A double-manured plat outyielded all others. Of 11 fertilizer treatments used on cabbage 20 tons of manure supplemented with 680 lbs. of nitrate of soda per acre gave the greatest yield on land which had been cultivated the preceding year and 2,000 lbs. of 5–8–7 (N–P–K) on land in sod the previous season. On new land the yields of cabbage were higher with acid phosphate used alone than with manure added.

Report of the horticulturist, W. M. Perry (*Virgin Islands Sta. Rpt. 1926, pp. 5–8, 9, figs. 3*).—Success in the growing and marketing of Bermuda onions is again reported (E. S. R., 55, p. 339). Eggplants, peppers, cucumbers, and tomatoes were also shipped successfully to New York. Florida butter beans selected for freedom from dark mottling came true to color. A comparison between home-grown and imported tomato seed suggested the desirability of purchasing seed for each crop. Notes are given on the behavior of various fruits.

Report of the horticultural division, W. T. Pope (*Hawaii Sta. Rpt. 1926, pp. 3–9, figs. 5*).—This report like that of the preceding year (E. S. R., 55, p. 534) consists principally of notes upon the behavior of various fruits, including the mango, avocado, papaya, banana, litchi, and the Macadamia nut.

[Horticultural investigations conducted by the Philippine Bureau of Agriculture] (*Philippine Bur. Agr. Ann. Rpt., 25 (1925), pp. 31–34, pls. 2*).—The usual progress report (E. S. R., 55, p. 644).

At Lamao the smudging and etherization of citrus trees had no apparent effect in inducing fruiting in barren and shy bearing individuals. Calamondin

and sour orange proved to be good stocks for bridge grafting. At Tanauan Sampson tangelos and mandarin oranges kept in good condition for several weeks in an underground chamber. The treatment of fruits with disinfectants proved deleterious.

Of six coffees tested at Lamao, the Liberian big berry type yielded the best beverage. Mangoes were successfully propagated by means of side grafts in which the lower part of the scion was inserted in a pot of soil and the upper part covered with damp moss. In a test of fertilizers for the pineapple a mixture of copra meal, potassium sulfate, and bone meal applied 2 months before the flowering period gave good results. Of four materials, rice straw, commercial mulch paper, grasses, and cogon, used as soil mulches, the rice straw proved most satisfactory. At Lamao the removal of the male banana blossoms following pollination hastened maturity by from 2 to 9 days and apparently increased size in the Katali and Toybok varieties.

Electrically heated hotbeds [trans. title], O. Moen, A. H. Bremer, and G. Jacobsen (*Meld. Norges Landbr. Høiskole, 7 (1927), No. 2, pp. 96–156, figs. 28; Eng. abs., pp. 152–156*).—Incidental to experiments conducted at the Norway Agricultural College near Oslo to determine the efficiency of electricity as a medium for heating hotbeds, it was found necessary to determine the temperatures at which various vegetables give satisfactory germination, a point designated by the authors as the economical temperature optimum and considerably lower than the absolute optimum. This point was determined for peas, radishes, tomatoes, and muskmelons as 45, 50, 61, and 70° F., respectively. Comparing manure and electricity as heat supplying media, it was found that where approximately the same temperature was maintained plant growth was nearly equal. Electricity had the advantage of being subject to better control, and the beds so heated required less watering because of the noninterference with capillary movement. Electrically heated beds could also be prepared at more favorable seasons.

Vegetables for home and exhibition, E. Beckett (*London: Simpkin, Marshall, Hamilton, Kent & Co., 1927 [3. ed., rev.], pp. [11]+420, figs. 88*).—This English text contains practical suggestions upon the culture of vegetables and their preparation for exhibiting purposes.

Home grown vegetables, edited by H. H. Thomas (*London and Toronto: Cassell & Co., 1927, pp. [6]+184, pls. 8, figs. 28*).—A popular discussion.

The beginner's garden, Mrs. F. King (*New York and London: Charles Scribner's Sons, 1927, pp. XII+125, pls. 12, figs. 9*).—A general discussion upon varieties, culture, etc.

Vegetable experiments at the Rhine Province Horticultural Station [trans. title] (*Veröffentl. Landw. Kammer Rheinprov., No. 11 (1927), pp. 14–21, pls. 4*).—The beneficial effect of supplemental carbon dioxide upon greenhouse cucumbers was shown in 20 and 12 per cent gains, respectively, for the two varieties tested. Of 8 varieties the Bonner Hausgurke was by far the most productive. Among tomatoes the Bonner Beste is deemed especially valuable because of its early maturing habit.

In a test of the effect of tar paper mulch upon the tomato, much better growth was obtained on the mulched than the control plats. A very cool, moist season interfered with ripening, but suggested that the gain in growth was due to heat rather than moisture conservation. A slightly deleterious effect of tar paper on bush beans was apparently due to the tar.

The action of ethylene in accelerating the blanching of celery, W. B. Mack (*Plant Physiol., 2 (1927), No. 1, p. 103*).—Studies at the Pennsylvania State College showed that extremely low concentrations, 1 part of ethylene

to 50,000 parts of air, not only effectively stimulated the blanching process in celery but were much more satisfactory than higher concentrations. In the case of 1 part of gas to 1,000 of air, splitting of the stalks occurred followed by pronounced pithiness. The acidity of celery juice was not affected by ethylene treatment. Determinations of carbon dioxide indicated that ethylene speeded up respiration, the maximum being attained at the 1:50,000 concentration. The removal of carbon dioxide by calcium oxide and potassium hydroxide increased the rate of blanching and also the amount of decay. In the presence of high amounts of carbon dioxide, ethylene at the rate of 1:10,000 failed to produce blanching. The author believes that the acceleration of blanching in the presence of ethylene is due to a stimulation of enzymatic activity.

A study of the factors determining quality in sweet corn, C. W. CULPEPPER and C. A. MAGOON (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 5, pp. 413–433, figs. 6*).—Continuing their general project upon the nature of quality in corn (E. S. R., 56, p. 534), the authors report upon a study of nine varieties representing a wide range in type, flint, dent, flour, waxy maize, and sweet corns, grown at Arlington Farm, Va., in 1925. Harvested at the 20-day stage, the canned product of Golden Bantam and Stowell Evergreen was distinctly superior in quality to that of the field types. At the same time these varieties were highest in water soluble polysaccharides. Soluble polysaccharides were relatively low in the flint, dent, and flour types but quite high in waxy maize. Natural sugar content reached its maximum before the corn attained canning maturity and is not considered sufficiently important to be the deciding factor in the selection of canning varieties. Sweetness may be secured by the simple addition of cane sugar.

A very considerable variation was noted in the several types and within each type at different stages of maturity in the toughness of the pericarp. The degree of toughness was much greater in the flint, flour, and waxy types than in the dent and sweet corns. The following factors appeared preeminent in determining the quality of canned corn: (1) Degree of tenderness of the pericarp, (2) nature of the polysaccharides present and the ratio of water soluble to total polysaccharides, (3) sugar content, and (4) the compactness with which the polysaccharides are laid down in the endosperm and possibly the structure of the endosperm itself.

Observations on the dropping of young fruits, L. R. DETJEN (*Peninsula Hort. Soc.* [*Del.*] *Trans., 40* (*1926*), *pp. 34–40*).—A general discussion of the fundamental principles underlying the abscission of immature fruits.

It was noted that varieties within a species differed markedly in the rate and the time of dropping fruit; for example, the Wealthy apple had one large wave, while Jonathan had one large and one or two smaller waves. That the percentage of the total fruits to drop before maturity is closely related to external factors was shown in the case of Jonathan trees. Of 12,034 flowers on an undernourished tree only 1,040 finally set, whereas on a comparable neighboring tree well supplied with nutrients 2,320 out of a total of 11,564 blooms set. In another pair of Jonathan trees which had received nothing but phosphoric acid for 18 years an experimental application of 5 lbs. of nitrate of soda at the time of full bloom very materially increased the set.

Apple growing in California, F. W. ALLEN (*California Sta. Bul. 425* (*1927*), *pp. 54, pls. 4, figs. 9*).—A general discussion taking into consideration the economics of the industry, the producing regions, varieties, location of the orchards, culture, pruning, control of pests, harvesting, marketing, etc.

An economic survey of the apple industry in Maine, C. H. MERCHANT [illegible] A study of data obtained

from 966 apple growers located in 13 counties and representing 14 per cent of the bearing and 18.9 per cent of the nonbearing trees in the State showed the Baldwin variety to be leading, followed in order by Ben Davis, McIntosh, Stark, Northern Spy, Wolf River, Wealthy, Delicious, Rhode Island, Gano, and Gravenstein. Altogether 106 known varieties were found.

That Maine is predominantly a winter apple State was shown in the fact that winter varieties comprised over 79 per cent of the total number of trees. In the nonbearing group there were nearly as many fall as winter apples. Slightly over one-third of the nonbearing trees were McIntosh. Most of the orchards were relatively small, over 73 per cent of the bearing trees being found in orchards of less than 1,000 trees. Over 80 per cent of the trees were of bearing age, and about 40 per cent of these were 30 years or older. Approximately three-fourths of the trees were in good condition.

In respect to marketing practices, local buyers were the most important outlet, taking in the 1924 season over one-half of the graded fruit. Over 86 per cent of the 1924 commercial crop was sold before December. Except in orchards of 1,500 trees or more, apple production was usually only one of several important farm enterprises. Gross receipts from apples furnished about 31 per cent of the growers' gross income in 1924.

Burrknot formations in relation to the vascular system of the apple stem, C. F. SWINGLE (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 533–544, pls. 5, figs. 4*).—Continuing his studies (E. S. R., 56, p. 140) upon burrknots in the apple, the author herein outlines the methods and technique employed in a histological study of burrknots and of the relation of their rudiments to the primary vascular system, which in the apple was found to consist entirely of common bundles each ending above in a leaf. The general course of the bundles was observed to be straight downward in the stem with few lateral connections. The author believes that root germs in the apple may be initiated at the following points in the cambium ring: (1) Branch gaps, (2) leaf gaps, (3) primary medullary rays, and (4) secondary medullary rays.

A study of woolly aphis galls showed these to have an entirely different structure than burrknots. There was found a great increase in the number of tracheid fibers produced in the affected region. No evidence was secured to indicate that burrknots ever arise from aphis swellings, and the author again affirms his belief that no pathogenic organisms are concerned in the formation of burrknots.

Apple breeding at the University of Illinois, C. S. CRANDALL (*Illinois Sta. Bul. 275 (1926), pp. 337–600, figs. 113*).—Supplementing an earlier report (E. S. R., 39, p. 844) which discussed the possibilities of improving apples by bud selection and by growing seedlings from exceptional parent trees, herein is presented a comprehensive review of experiments in hybridizing reciprocally between standard varieties and other species and varieties of Malus, upon hybridizing standard orchard varieties, and crossing different strains of the same variety or selected individuals of the same strain. Descriptions are given of the methods of technique employed and of the various species and varieties used as parents, and a record is presented of the present status of more than 20,000 seedlings which have resulted from breeding operations.

Apple pollination studies in California, E. L. OVERHOLSER (*California Sta. Bul. 426 (1927), pp. 17*).—The beneficial effect of bees and other insects in apple pollination was indicated in records taken upon trees inclosed in screen tents with and without bees. In Yellow Newtown, a self-fertile variety, the percentage of set of the tree with bees was 18.62, as compared with 0.28 for blooms from which insects were excluded, and 29.96 for openly exposed flowers. Yellow

Newtown, Esopus, and Baldwin were found self-fruitful. Yellow Bellflower, Gravenstein, White Pearmain, Tompkins King, Rhode Island, Delicious, Red Pearmain, and Jonathan were found self-unfruitful. Gravenstein proved to be an unsatisfactory pollinizer for any of the other varieties, a fact believed to be associated with imperfect nonviable pollen. Yellow Bellflower, Red Pearmain, and White Pearmain proved to be satisfactory pollinizers for Yellow Newtown; Yellow Newtown and Delicious for Yellow Bellflower and Gravenstein; Jonathan for Tompkins King; Jonathan and Delicious for Esopus; and White Pearmain and Red Pearmain were found mutually interfertile. Other combinations giving negative or commercially unsatisfactory results are listed.

Some physiological considerations of the "Delicious" apple, with special reference to the problem of alternate bearing, E. R. Ranker (*Amer. Jour. Bot., 13 (1926), No. 7, pp. 406–426*).—Studies upon Delicious apple trees located in three Utah orchards representing different degrees of culture showed a distinct tendency to alternate bearing in this variety. An average of 54 per cent of spurs blooming in 1923 and 8 per cent in 1924 is deemed fairly typical of the general situation. Only 1.5 per cent of the spurs blossomed in consecutive years. Terminal fruiting was also rare, averaging 5.9 per cent over a 5-year period in the three orchards. Fruit bud differentiation began about June 19 and continued until the last of August. No second period of bud formation was noted except in a few isolated cases of buds on second growth wood.

Pollination studies showed complete self-sterility in bagged clusters, whether the blooms were jarred to release pollen or whether pollen was artificially applied from the same cluster or from blooms of other clusters or trees. Jonathan pollen proved to be very satisfactory for fertilizing Delicious blooms. Observations in orchards exposed to a severe wind showed that wind was of no benefit, but on the other hand quite harmful to pollination, apparently by excluding insects.

Of various treatments, namely, ringing, heading back, thinning out, and removal of part of the spurs, tested for their effect upon fruit bud formation, ringing proved most effective. Reducing the number of blossoms per cluster had little benefit as the Delicious was found to be naturally self thinning; that is, the first bloom to open developed into fruit while the others generally abscised.

The relation of maturity of California plums to shipping and dessert quality, F. W. Allen, J. R. Magness, and M. H. Haller (*California Sta. Bul. 428 (1927), pp. 41, figs. 4*).—Recognizing the importance of harvesting plums designed for eastern shipment as ripe as possible, determinations were made in this cooperative study of various physical and chemical changes accompanying ripening which might be useful indexes to maturity. Measurements of plums showed that at the time of the usual harvest fruits are increasing in volume from 1.5 to 2 per cent daily. Color changes were found to be influenced by sunlight exposure, etc., but when checked with softening of the flesh, as measured by a mechanical tester, proved the most accurate guides to maturity. There was found an increase in soluble solids and in sugar content and a decrease in acidity as the fruits approached maturity. The amount of soluble solid increase during the brief harvest period was not sufficient to make hydrometer readings satisfactory indicators of maturity.

After picking, unless exceedingly immature, plums continued to take on color if stored above 36° F. At 52° most varieties softened almost twice as fast as at 43°. Except for a few of the meaty fleshed varieties plums showed no gain in sugar after picking, and there was practically no increase in soluble solids. The acid content of the expressed juice decreased rapidly after harvesting, but in the fruit as a whole acidity decrease was very slight.

Records taken in refrigerator cars during transit showed the temperature near the floor to average about 40° and in the top about 53°. Fruit averaging 75 to 80° when loaded required 12 hours to reach 45° in the car. Observations upon fruit at the destination indicated that plums are now being picked as ripe as is practicable under present handling methods, but it is suggested that if fruits were precooled before loading it might be possible to allow the fruit to stay on the trees a little longer, thus insuring higher quality.

The influence of reaction of culture medium on growth of strawberry plants, L. S. MORRIS and J. W. CRIST (*Michigan Sta. Tech. Bul. 77 (1927), pp. 16, figs. 6*).—Studies of the response of the strawberry to acidity relations in the soil led to the conclusion that in practically all agricultural soils reaction per se is not an important limiting factor in strawberry production. However, on a muck soil so acid in reaction that even very acid tolerant plants were apparently unable to grow, strawberries were greatly benefited by lime applications which satisfied from one-third to two-thirds of the requirements. Beyond this point growth was no better than where no lime was added.

Observations upon strawberry plants growing in water cultures of known pH value showed 100 per cent survival, the best growth and the largest average gain in weight in the 5.7 solution. In a second water culture experiment those plants in solutions pH 4, 5, 6, and 7 all made satisfactory growth. Plants in pH 8 gradually weakened, those in pH 9 started to die 6 days after being placed in the culture, and those in pH 3 were dead within 12 days. Iron and aluminum absorption was greater from the more acid solutions.

In a number of Michigan soils which were supporting a growth of strawberry plants there was found a wide range in tolerance to soil reaction from the extreme acidity on the edge of a muck area to a mild alkalinity near buildings. The nature of the alkalinity is deemed an important factor; for example, the failure of strawberries to survive in a certain alkaline Utah soil is thought due to a large content of soluble salts.

Sterility and fertility in the strawberry, G. M. DARROW (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 393–411, figs. 14*).—Observations on the flowers of various species and varieties of strawberries growing at Glenn Dale, Md., showed that environmental factors, as well as heredity, have a marked influence on the percentage of sterility in the strawberry. The effect of seasonal changes was shown in the case of 28 normally perfect flowered varieties which bore some imperfect flowers in 1925 and all perfect in 1926. The effect of soil was shown in the case of Ettersburg No. 121, which, although normally perfect flowered, was nearly sterile when grown on a sandy soil at Glenn Dale. Records taken upon plants, the date of whose original rooting was known, showed a distinct tendency for the percentage of sterile flowers to increase with later rooting. Covering of plants with light-proof boxes did not prevent blooming, but the flowers were without petals or stamens. The presence of pistils is considered evidence of their earlier formation. Autumn, the season of flower-bud differentiation, is deemed the critical period affecting sterility. Spring applications of fertilizers, for example, had no influence on the proportion of sterile blooms.

Hereditary influences were shown in a very considerable amount of sterility in crosses between a nearly sterile hermaphroditic form of *Fragaria chiloensis* and cultivated varieties. Sterility was apparently associated with hermaphroditism, as perfect flowered forms of *F. chiloensis* from the Pacific coast were nearly completely sterile, while pistillate or imperfect forms set all their blooms. Apparent intermediates between perfect and imperfect forms were obtained. Varieties with a habit of setting fruit only in the first blooms failed

to set when these were destroyed by frost. Late formed trusses usually showed a higher percentage of sterile flowers than did the early trusses. A record is presented in tabular form of the proportion of sterility in a large number of cultivated varieties.

A treatise on viticulture, A. I. PEROLD (*London: Macmillan & Co., 1927, pp. XI+696, pls. 2, figs. 107*).—Prepared largely from the viewpoint of the vinifera grape, this comprehensive treatise takes up the anatomy of the vine and flowers, the physiology of nutrition, propagation, varieties, diseases and insects and their control, etc.

Oranges and other citrus, R. DE NOTER ET AL. (*Les Orangers, Citronniers, Cédratiers, et Autres Aurantiacees à Fruits Comestibles. Paris: Soc. Éd. Geogr. Marit. et Colon., 1926, pp. 210, figs. 69*).—A general discussion relating to varieties, species, and culture.

Cool storage of Washington Navel oranges, G. B. TINDALE (*Jour. Dept. Agr. Victoria, 25 (1927), No. 2, pp. 74–80, fig. 1*).—Experiments conducted by the Department of Agriculture of Victoria, Australia, upon the effect of prestorage treatment upon the keeping quality of Washington Navel oranges showed the advantage of careful picking and also of sweating prior to cold storage. Fruits treated in this manner kept in good condition for periods up to 3 months. The best storage temperature was around 36° F. At 32–34° fruits become soft and lifeless and decayed shortly after removal from the storage chambers.

Magnolias, J. G. MILLAIS (*London and New York: Longmans, Green & Co., 1927, pp. VIII+251, pls. 34*).—This comprehensive treatise presents descriptive material upon magnolias collected in all parts of the world.

Pollination experiments with oil palms, J. N. MILSUM and E. A. CURTLER (*Malayan Agr. Jour., 14 (1926) No. 12, pp. 384–393, pls. 3*).—The artificial pollination of the flowers of young oil palms growing at the Experimental Plantation, Serdang, Federated Malay States, resulted in a greater number of mature bunches of fruits which averaged materially heavier in weight and in the number of fruits per bunch. Data taken at the same time upon the height, spread, and trunk girth of the palms failed to show any perceptible differences in the size of the plants in the pollinated and nonpollinated groups.

The gladiolus book, F. T. MCLEAN, W. E. CLARK, and E. N. FISCHER (*Garden City, N. Y.: Doubleday, Page & Co., 1927, pp. XV+233, pls. 20, figs. 3*).—A general treatise on the development of the gladiolus, and upon hybridization, propagation, culture, species, and varieties and their classification.

A study of Pogoniris varieties, A. W. W. SAND (*New York Cornell Sta. Mem. 100 (1926), pp. 159, pls. 3, figs. 52*).—Based on a study of a large collection of species and varieties of iris, there is herein presented information on the botany of the genus, a key to the subdivisions, and keys to the species within the various subdivisions. Descriptions are presented of garden varieties in the Pogoniris group beginning with the letter A and extending through F.

The American rose annual, 1927, edited by J. H. MCFARLAND (*Harrisburg, Pa.: Amer. Rose Soc., 1927, pp. 232, pls. 19, figs. 3*).—Prepared in the same general form as that of the preceding year (E. S. R., 55, p. 442), this number includes among its papers the following: Rose Understocks at Arlington Farm, by G. E. Yerkes (pp. 47–52), which is a brief discussion of the influences of various rootstocks upon the vigor and productivity of certain well-known hybrid tea roses; Chromosomes and Their Relation to Rose Problems, by K. B. Blackburn (pp. 54–58); Artificial Fertilization in the Production of New Roses, by J. Pernet-Ducher (pp. 63–65); Handling Seeds and Seedlings, by A. G. Fraser (pp. 69–71); and Brown Canker of the Rose, by A. E. Jenkins (pp. 161–182).

Sweet peas for amateurs, N. LAMBERT and H. H. THOMAS (*London and Toronto: Cassell & Co., 1927, pp. VIII+183, pls. 8, figs. 29*).—This comprises simple cultural and varietal information.

Rock plants, W. BRETT (*London: George Newnes, [1926], pp. 64, pls. 7, figs. 10*).—A small handbook relating to the construction of rock gardens and the choice of plant materials therefor.

Garden architecture, T. G. W. HENSLOW (*London: Dean & Son, 1926, pp. X+240, pl. 1, figs. 119*).—A pictorial guide for gardens, old and new.

FORESTRY

Check list of the forest trees of the United States, their names and ranges, G. B. SUDWORTH (*U. S. Dept. Agr., Misc. Circ. 92 (1927), pp. 295*).—A revised and enlarged edition of the previously noted publication (E. S. R., 10, p. 643). As compared with 504 species, 80 varieties, and 20 hybrids enumerated in 1898, there are in the present edition 862 species, 228 varieties, and 87 hybrids.

The national forests of California, R. W. AYRES and W. HUTCHINSON (*U. S. Dept. Agr., Misc. Circ. 94 (1927), pp. II+34, figs. 28*).—This circular contains general information on the history of the forestry movement in California; the location of the national forests in that State and their value in conserving timber, water, wild life, grazing, and recreational resources; the administration of the forests; fire control, etc. Statistical information upon lumber yields, forest fires, etc., is appended.

Forestry facts (*U. S. Dept. Agr., Forest Serv., 1927, pp. 16*).—Prepared for distribution during the American Forest Week, April 24–30, 1927, this is a compendium of short items, paragraphs, and handy information for use by newspapers and speakers, teachers, and other interested parties.

Spring or autumn sowing [trans. title], E. WIBECK (*Meddel. Statens Skogsförsöksanst. [Sweden], 23 (1927), No. 4, pp. 217–294, figs. 9; Eng. abs., pp. 286–294*).—Experiments conducted at the same time and in the same manner in different places in Sweden to compare spring and autumn sowing of *Pinus silvestris* seeds showed in almost every instance more favorable results from spring sowing. The beneficial effects of spring sowing were greatest at the most southerly station and gradually decreased northward. Of three methods of sowing compared, namely, (1) square sowing with, and (2) square sowing without loosening the soil, and (3) strip sowing, none was outstanding. The conclusion is reached that under north Swedish conditions the advantages from precultivation of the soil do not offset the added cost. Observations upon the seeds showed that those sown in autumn suffered a much greater loss in germination than did spring-sown seeds, but the nature of these injuries remains to be determined.

The natural replacement of blight-killed chestnut, C. F. KORSTIAN and P. W. STICKEL (*U. S. Dept. Agr., Misc. Circ. 100 (1927), pp. 15, pls. 4*).—Studies in the forests of northeastern United States, from which area chestnut has been eliminated by the devastating blight *Endothia parasitica*, show that other species—oaks, hickory, ash, sugar maple, and sweet birch—are rapidly filling in the vacancies created by the death of the chestnuts. Oak stands have responded to the release by making accelerated growth ranging from 26 per cent in white to 63 per cent in red oak, and are thus effectively closing the gaps left by the chestnut. The increased growth rate is, however, less than that of chestnut. Cuttings which increase the proportion of oak, ash, and hickory in the new stands are deemed advisable. As chestnut sprouts grow more rapidly

than sprouts of other species the authors recommend that whenever feasible the cutting of blighted chestnut be deferred until the trees are completely dead. Natural replacement is deemed adequate to insure restocking without planting.

DISEASES OF PLANTS

Manual of plant diseases, F. D. HEALD (*New York and London: McGraw-Hill Book Co., 1926, pp. XIII+891, figs. 272*).—The plan of presentation of this book is said to be essentially the same as that which has been followed in the author's classes. An attempt has been made to present a view of the whole field of plant pathology, including environmental and virus diseases as well as those of bacterial and fungus origin. No attempt has been made to present an organized treatment of cultural methods and general plant pathology technique, or of the principles and practice of disease control. In the treatment of the parasitic diseases the plan follows the taxonomic sequence rather than host groups. Consideration has been given to types of disease, economic importance, causal factors or pathogenes, and control methods. The final chapter is devoted to nematodes and the diseases which they cause in plants.

Inner therapy of plants [trans. title], A. MÜLLER (*Monog. Angew. Ent. No. 8 (1926), pp. VI+206, figs. 32*).—In the interest of plant therapy it is important to secure wide collaboration of zoologists, botanists, chemists, and in particular physiologists in ways which are indicated.

Indiana plant diseases, 1924, M. W. GARDNER (*Ind. Acad. Sci. Proc., 41 (1925), pp. 237-257, figs. 8*).—This is the sixth of a series (E. S. R., 56, p. 647) of annual summaries of the plant-disease situation in this State.

"The diseases of outstanding importance this season were as follows: Apple scab, blotch, black rot, and rust; Macrosporium leaf blight of cantaloupe; celery late blight (Septoria); cherry leaf spot; corn root rot; currant anthracnose; gooseberry leaf spot and anthracnose; grape black rot; peach bacterial spot; potato leaf roll and mosaic; radish black root; raspberry anthracnose; strawberry leaf spot; tomato leaf spot (Septoria) and early blight (Alternaria); aster yellows (nonparasitic); sycamore anthracnose.

"The diseases or parasitic organisms apparently not previously reported for the State include *Bacterium phaseoli* on hyacinth bean, *B. vignae* on asparagus bean, *Sclerotinia vaccinii-corymbosum* on blueberry, *Peronospora parasitica* on cabbage, rosette of curled endive, *B. trifoliorum* on red clover, *Cladosporium vignae* on cowpeas, cowpea wilt due to *Fusarium vasinfectum tracheiphilum* and crown rot due to *Rhizoctonia solani*, *Plectodiscella veneta* on dewberry, Cercospora leaf spot of lettuce, bacterial leaf spot of pumpkin, rutabaga mosaic, *B. translucens* var. *secalis* and *Septoria secalis* on rye, Rhizoctonia crown rot of soybean, strawberry mosaic, Cercospora leaf spot of Boston fern, Phytophthora leaf blight of peony, strawflower yellows, *Colletotrichum malvarum* on hollyhock, brown patch disease of bent grass golf greens caused by *R. solani*."

Plant pathology (*New Hampshire Sta. Bul. 227 (1927), pp. 35, 36*).—The effects of 1 per cent Bordeaux mixture on apples, with several copper-lime ratios, were studied by O. R. Butler, who found that on the fruit the injury produced was about equally intense to and including the ratio 1:2, but that it became negligible at 1:4 and beyond. The foliage is somewhat less susceptible than the fruit.

In tests of the effect of reducing lime sulfur (1:50) sprayings on McIntosh apples from three to two it was found that whereas with prepink, pink, and calyx sprayings the percentage of scab was only 5, with the pink spraying omitted it was 13.78. With Bordeaux mixture for prepink and pink sprays and

lime sulfur for the calyx spray the scab control was better than with lime sulfur for all three sprayings.

In experimentation with apple bitter pit, fertilization as a whole in 1924 was beneficial in only 60 per cent of the cases. In 1925 the plats furnishing complete data showed fertilization to be beneficial in only 40 per cent of the cases. In both 1924 and 1925 the plats fertilized with phosphoric acid, phosphoric acid and potash, and phosphoric acid, potash, and lime produced fruit freer from bitter pit than did the check plats. In 1924 the fruit borne in the nitrogen and lime and the nitrogen and potash plats were freer from bitter pit than that borne by the check plats, but in 1925 this condition was reversed. In 1924 and 1925 the potash and the potash-plus-lime plats produced fruit freer from bitter pit than did the check plats.

[Plant diseases, Wageningen, 1924], N. VAN POETEREN (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 41 (1925), pp. 34–53, fig. 1*).—Both diseases and other pests of plants are dealt with.

Annual report of the lecturer on plant pathology, G. SAMUEL (*So. Aust. Min. Agr. Rpt. 1924, pp. 76–78*).—An account of the diseases of the year is given.

The classification of plant viruses, J. JOHNSON (*Wisconsin Sta. Research Bul. 76 (1927), pp. 16, pls. 8*).—The existence of 11 different viruses in tobacco and related plants is claimed to have been established on the basis of their behavior toward various factors which are applicable as tests. The most useful of these tests were the symptomatology in case of different hosts, the longevities in vitro, the thermal death points, and the different lethal actions of chemicals. It is suggested that these factors form a basis for the description of a virus, and that some form of classification and nomenclature should be established for plant viruses. Behavior of plant viruses under different conditions is said to make it possible in many instances to separate two or more viruses when these coexist in a single plant. It is possible to attenuate or to increase virulence in case of some plant viruses, though in most cases viruses appear from the evidence to be relatively stable and specific entities.

Penetration phenomena and facultative parasitism in Alternaria, Diplodia, and other fungi, P. A. YOUNG (*Bot. Gaz., 81 (1926), No. 3, pp. 258–279, pls. 3*).—This problem was undertaken to determine the penetration phenomena and experimental host ranges of many dematiaceous and some other fungi. Eighty-eight isolations of fungi and two of bacteria were used in the random inoculations of 78 species and varieties of flowering plants.

Mechanical injury alone caused cells of wheat, sorghum, and broomcorn to become markedly discolored near the points of injury. Such discolored regions lacked callosities, auto-stained disks, red rings, and other infection phenomena. The 200 new diseases which resulted from the cross inoculations occurred under conditions very unlike those in the field. Particulars are given.

Mycoidea parasitica, a parasitic, and Phycopeltis epiphyton, an epiphytic alga in Japan [trans. title], H. MOLISCH (*Tôhoku Imp. Univ., Sci. Rpts., 4. ser., 1 (1925), No. 2, pp. 111–118, pl. 1*).—*M. parasitica* was found to be pathological to leaves of *Camellia* sp., *Eurya japonica*, and *E. ochnacea*. The disturbing agent seems to be some substance which diffuses from cell to cell, but only somewhat superficially. *P. epiphyton* is abundant on leaves of various evergreens named.

Comparative effects of salts of copper, nickel, zinc, iron, and aluminum on various parasitic fungi [trans. title], H. FAES and M. STAEHELIN (*Mém. Soc. Vaud. Sci. Nat., 2 (1925), No. 2, pp. 73–139, figs. 3*).—This account, which includes lengthy tabular detail, sets forth briefly the moist chamber and the sterilized fruit juice method, and at greater length the data involving the

culture in various nutritive media with or without agar of *Botrytis cinerea*, *Trichothecium roseum*, *Sterigmatocystis nigra*, *Rhizopus nigricans*, *Sclerotinia laxa*, *S. fructigena*, and *Penicillium glaucum*. Comparisons are made regarding the general efficiency and particular phases of the several fungicidal agents.

Sprays and spraying materials, T. J. Talbert (*Amer. Soc. Hort. Sci. Proc.*, *22 (1925)*, *pp. 44–53*).—A compact history, with short bibliography, is given of sprays, spreaders, and stickers.

Brown-patch investigation, R. A. Oakley (*Bul. Green Sect. U. S. Golf Assoc.*, *4 (1924)*, *No. 4*, *pp. 87–92*, *figs. 2*).—A brief history is given of large brown patch of grassy areas due to *Rhizoctonia solani*, which is said to attack at least 500 species of plants. This grass brown-patch organism is very rarely troublesome except in hot, humid weather. Kentucky bluegrass is practically immune, as are also Bermuda grass and white clover, but *Poa annua* and *P. trivialis* are very susceptible. Bordeaux mixture, if frequently and systematically used, was found to be a fairly practical preventive, probably the best available. Bordeaux dust is more economical. Other fungicides tested were mostly unsatisfactory or harmful.

Some things we have learned about brown-patch, R. A. Oakley (*Bul. Green Sect. U. S. Golf Assoc.*, *5 (1925)* *No. 4*, *pp. 75–77*).—Progress in brown-patch control has been made with fungicides, cultural treatments, and the selection and use of resistant strains of grass. Bordeaux mixture has proved to be not entirely satisfactory for large brown patch and not of any considerable value for small brown patch. Mercury chlorophenol is regarded as a promising fungicide for the treatment of brown patch, particularly the small form.

Experiments on the control of brown-patch with chlorophenol mercury, G. H. Godfrey (*Bul. Green Sect. U. S. Golf Assoc.*, *5 (1925)*, *No. 4*, *pp. 83–87*, *figs. 3*).—In July, 1924, small brown patch began to show in turf of *Poa annua*, near Yonkers, N. Y. The experimentation herein outlined as to fungicides and results showed very good results from Bordeaux mixture and better, perhaps, from mercury chlorophenol, other disinfectants giving various results.

July experiments for control of brown-patch on Arlington experimental turf garden, J. Monteith, Jr. (*Bul. Green Sect. U. S. Golf Assoc.*, *5 (1925)*, *No. 8*, *pp. 173–176*, *fig. 1*).—Early July outbreaks of brown patch near Washington coincided with an unusual prevalence of brown patch in other parts of the country. The Arlington experimental plats showed little active large brown patch, though the small brown patch developed throughout the month on the more susceptible grasses, offering opportunity to test various disinfectants as well as the preventive effects of previous treatments, but the results were not entirely conclusive. The mercury chlorophenol treatments, Semesan, and Uspulun, gave practically identical results. The most efficient treatment for this year, as for the previous year, was that using 1 lb. of the mercury compound to 50 gal. of water, when sprayed over 1,000 ft. or more under a good uniform pressure. For checking large brown patch it was found that 1 lb. in 50 gal., applied as a fine spray to an area of 3,000 to 6,000 sq. ft. was effective.

August experiments for control of brown-patch at Arlington experimental turf garden, J. Monteith, Jr. (*Bul. Green Sect. U. S. Golf Assoc.*, *5 (1925)*, *No. 9*, *pp. 202, 203*).—There was no widespread attack of the large brown patch during August, and little opportunity was offered to observe control treatments. However, chlorophenol mercury applications, under the conditions existing, could not be relied upon to keep the greens free from brown patch for any prolonged periods, such as have been claimed. Any application of more than 1 lb. per 1,000 sq. ft. has failed to show added protection sufficient to justify the increased cost of material.

The results with chlorophenol mercury as a control for small brown patch, which was very common, have generally been similar to those reported for July, but showed a shorter period of protection. The tests with chlorophenol and nitrophenol mercury dusts gave somewhat better control than in July, though they did not show any advantages over similar treatments in liquid form and they are expected to be found less efficient in the liquid applications. Other mercury compounds gave promising results, but usually no longer protection than the chlorophenol mercury. Copper fungicides appeared to be practically ineffective.

The season's experience with chlorophenol mercury as a control for brown-patch, J. MONTEITH, JR. (*Bul. Green Sect. U. S. Golf Assoc., 5 (1925), No. 12, pp. 272, 273*).—During the summer of 1925 mercury chlorophenol in the forms of Uspulun and Semesan was tested for brown patch in practically every section of the country where bent grass is used for putting greens. Summaries obtained in regard to these tests are here reviewed as a whole, and it is stated that these summaries agree closely with the results of observations previously reported from Arlington, Va., as above noted.

The conclusion reached in practically all sections is that mercury chlorophenol is effective as a means of checking the disease if it is properly applied, but that the duration of this effect is uncertain, varying according to the season, locality, severity of attack, and other influences. It is regarded generally as an expensive precautionary treatment, especially in localities where disease attacks are frequent. The expense can probably be reduced by a careful timing of the treatments. The rate most generally used and regarded as the best for most conditions is 1 lb. in 50 gal. of water to 1,000 sq. ft. of turf. Heavier applications appeared unsatisfactory in view of the additional cost, and in some cases a lighter application gave good results. Various methods of application have been used, the more common being the sprinkler, using a barrel with gravity feed, and a spray with a standard proportioner machine. The length of time this chemical will protect a green when applied at 1 lb. per 1,000 sq. ft. shows considerable variation. In some cases the disease was not controlled. The expense seems to be the chief objection to mercury chlorophenol. It seems advisable to make the applications when the weather conditions are favorable for the disease. The dust method of application does not appear to be satisfactory.

Control of turf diseases with chemicals, J. MONTEITH, JR. (*Bul. Green Sect. U. S. Golf Assoc., 5 (1925), No. 10, pp. 219–223, figs. 2*).—Experiments in the summer of 1925 included a large number of chemicals, the results from which are reported in some detail. The best method of application of mercury bichloride is still to be determined. There seems to be more danger of burning the grass with bichloride than with most of the organic mercury combinations, though by proper application this injury may be avoidable. The protection given by the bichloride appears to last as well as that from the organic mercury forms. It appears probable that mercury in either form undergoes various chemical reactions in the soil, and that the protective qualities are derived from this source. The important point is that the mercuric chloride protects the turf from brown patch at much lower cost than any of the organic compounds now on the market. It is found also that under conditions extremely favorable for the development of brown patch in midsummer it will not prevent brown patch for more than a short period, and this is true of the organic mercury compounds so far tested.

"Air pockets" and brown-patch, J. MONTEITH, JR. (*Bul. Green Sect. U. S. Golf Assoc., 5 (1925), No. 8, p. 180*).—Brown patches on golf courses bear some

relation to insufficient air drainage. One example of this is cited and others are referred to. In a large proportion of the cases the conditioning factor, poor air drainage, could be removed simply by cutting openings through the shrubbery in the direction of the prevailing wind.

Brown-patch control resulting from early-morning work on greens, A. SCHARDT (*Bul. Green Sect. U. S. Golf Assoc., 5 (1925), No. 11, pp. 254, 255*).—It was found that those putting greens which had been subjected to the first early morning (7 o'clock) sweeping with the bamboo pole to remove dew and worm casts before cutting showed no signs of brown patch, whereas those which had been swept after the dew had dried off were affected in every case with brown patch.

[Blue grass leaf spot], J. MONTEITH, JR. (*Bul. Green Sect. U. S. Golf Assoc., 4 (1924), No. 7, pp. 172, 173; 5 (1925), No. 9, pp. 198, 199, fig. 1*).—The first of these notes briefly describes a browning leaf spot of bluegrass on fairways at Clementon, N. J., and at Philadelphia. It is more pronounced where the grass is clipped close. The second note states that the same disease appeared on various courses near Washington, D. C., and on experimental plats at Arlington, Va. It is supposed to be generally distributed and is expected to appear on many golf courses. It is said to be entirely different from brown patch of putting greens. It does not spread to plants other than bluegrass.

Bacterial diseases of cereals [trans. title], A. A. ÎACHEVSKIĬ (JACZEVSKY) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 14 (1924–25), No. 1, pp. 377–385; Eng. abs., p. 385*).—A diagnosis is given of wheat black chaff, associated with the organism which was previously named in connection with the work of Smith and others as *Bacterium translucens undulosum* (E. S. R., 41, p. 246). Black chaff was found on wheat samples from several places indicated.

Varietal resistance of spring wheats to Tilletia levis, E. C. STAKMAN, E. B. LAMBERT, and H. H. FLOR (*Minn. Univ., Studies Biol. Sci., No. 5 (1924), pp. 307–317*).—In tests of about 870 spring wheat varieties and selections grown for two years, and of a smaller number of varieties grown for five years, in order to ascertain the comparative resistance of these forms of Triticum to bunt (*Tilletia levis*), it was found that in general the vulgare group, consisting of *Triticum vulgare, T. compactum,* and *T. spelta,* seems to be susceptible. The dicoccum group, consisting of *T. durum, T. dicoccum, T. turgidum,* and *T. polonicum,* is resistant, as is also the monococcum group, *T. monococcum.* The qualities of varieties of these different forms are discussed.

A transit disease of snap beans caused by Pythium aphanidermatum, L. L. HARTER and W. A. WHITNEY (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 443–447, pl. 1*).—A study is reported of a snap bean transit disease ascribed to *P. aphanidermatum.* This is said to cause some symptoms resembling those due to *Sclerotinia* sp., though *P. aphanidermatum* causes the more rapid destruction and shows a more abundant growth of white cottony mycelium. Inoculation experiments showed that the "nesting" symptom may be produced also by *P. ultimum, P. splendens,* and *P. myriotylum. P. debaryanum* is a wound parasite only, as it can not attack sound tissue. None of the Pythiums with spiny oogonia proved to be parasitic. *P. aphanidermatum* is said to be very common on beans in transit during the warmer months of the shipping season.

Peronospora parasitica on cabbage [trans. title], T. H. THUNG (*Tijdschr. Plantenziekten, 32 (1926), No. 6, pp. 161–179, pls. 2, figs. 6*).—A study as detailed of *P. parasitica* on cabbage reveals two forms, showing what are claimed to be characteristic morphological differences.

Diplodia ear-rot disease of corn, E. E. CLAYTON (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 4, pp. 357–371*).—This investigation, pursued during 1921 and 1922 at the Ohio Experiment Station and during 1923, 1924, and 1925 at the New York State Station, dealt with *D. zeae* primarily as a destructive ear rot.

Infections of the ears begin usually at the butt, apparently entering by way of the shank. Though the ears are susceptible at almost any stage, they mold worst when infected early. The fungus remains active until the infected ears have become thoroughly dry. Ears infected late in the season, which may be selected for seed (as they are not visibly molded), tend to give poor stands and low yields unless thick planting is practiced. No increase occurred in ear rot due to sowing diseased seed over a 3-year period. Almost 100 per cent freedom from Diplodia ear-rot infection was obtained by planting diseased and healthy seed on land not cropped previously to corn for 3 years, if some distance from fields containing old stalks and other corn rubbish.

Where Diplodia infection is anticipated, early removal of seed ears will prevent in large part such infection. Prompt drying will check the spread of the fungus in cases where ear infection has already occurred.

[Cotton disease control work], E. SHEARER (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 3* (*1922*), *pp. 27–40, pls. 3*).—This portion of the report presents details and tables regarding cotton sore shin control tests and studies on cotton wilt, isolations from one form of this agreeing with the Fusarium stage of *Neocosmospora vasinfecta*.

Biochemistry of plant diseases.—The biochemistry of Fusarium lini Bolley, A. K. ANDERSON (*Minn. Univ., Studies Biol. Sci., No. 5* (*1924*), *pp. 237–280, figs. 12*).—*F. lini*, the flax wilt organism, is not sensitive to extremes of hydrogen- and hydroxyl-ion concentration of the medium on which it grows. It has grown on media with initial pH values of from 1.84 to 12.04, and the range for good growth is wide, extending from pH 3.5 to 9.5. The optimum for growth appeared to be at about pH 5 in two cases, and pH 7 in a third case. A somewhat detailed summary is given as regards a number of items, such as pH, carbon source, and metabolic products.

On the presence of a perennial mycelium in Pseudoperonospora humuli (Miyabe & Takah.) Wils., E. S. SALMON and W. M. WARE (*Nature* [*London*], *116* (*1925*), *No. 2908, pp. 134, 135*).—Having given (E. S. R., 55, p. 749) a description of hop downy mildew as noted recently in England, the authors now record certain facts recently ascertained. Alarming features are the epidemic nature of downy mildew attacks and the early attack on the young stems.

Preliminary notes on tip-burn of lettuce, R. A. McGINTY and R. C. THOMPSON (*Amer. Soc. Hort. Sci. Proc., 22* (*1925*), *pp. 341–346*).—Preliminary data are presented from studies on the relation, if any, of carbohydrates and other constituents to tipburn. In the greenhouse-grown lettuce used in these experiments, the monosaccharides, disaccharides, and polysaccharides are all significantly higher in healthy than in tipburned plants. No significant difference appears in the pentosan content, and it is regarded as doubtful if the amount of pentosan in lettuce plants is sufficient to affect the water-retaining capacity. Almost without exception, the percentage of dry matter in tipburned plants grown in the greenhouse has been found to be less than that of healthy plants. Abundant soil moisture and a high water content in the plants are both favorable for the development of tipburn. Field observations indicate that high temperatures encourage but do not cause tipburn, that tipburn may occur when the relative humidity is high and transpiration is below normal, and that the disease is not due to excessive water loss caused by a high transpiration rate.

The nuclear phenomena and life history of Urocystis cepulae, A. W. Blizzard (*Bul. Torrey Bot. Club, 53 (1926) No. 2, pp. 77–112, pls. 4, fig. 1*).—Onion seedlings, as they make their way up through the soil, become infected with *U. cepulae*, pustules of which appear on the cotyledons within three or four weeks. Data are given regarding the biology and relations of the fungus, which was isolated and grown on onion agar, sterile potato, onion, bean, and carrot.

Transmission of a rosette disease of the ground nut, H. H. Storey and A. M. Bottomley (*Nature [London], 116 (1925), No. 2907, pp. 97, 98*).—Work carried out independently at Pretoria and at Durban has proved the ability of *Aphis leguminosae* to spread a rosette disease of *Arachis hypogea*, which is briefly described.

Pigeon pea anthracnose, C. M. Tucker (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 589–596, figs. 3*).—Pigeon pea (*Cajanus indicus*), an important food crop in Porto Rico, is attacked by an anthracnose which spots the pods and leaves and may destroy the seeds. Young leaves, infected usually on the veins, blacken and shrivel. Young pods are distorted, aborted, and killed. The losses are due to the destruction of the young pods or to the decay or discoloration of one or more of the seeds. Infection is most serious during periods of heavy rainfall. The causal organism is referred to *Colletotrichum cajani*, said to be now first recorded as the cause of a pod and seed disease.

[Potato disease investigations at the New Hampshire Station] (*New Hampshire Sta. Bul. 227 (1927), pp. 11, 12–14*).—In experimentation by O. R. Butler regarding the effects of early harvesting on freedom from degeneration diseases (mosaic, leaf roll, and yellow dwarf), and on the productivity of potatoes, results on the whole more definite and somewhat more favorable to the plan were obtained with Irish Cobbler than from Green Mountain. A study of the effects of heightened temperature (28° C.) on potatoes as regards lowering of mosaic injury gave encouraging results, and these were increasingly favorable in correspondence with the longer exposure periods (1, 2, and 4 hours).

In comparative tests of the values of hand dusting and spraying for the control of potato diseases, the efficiency of the unit copper in Sanders dust appeared to be low as compared with that of the unit copper in Bordeaux mixture. Fortnightly as contrasted with weekly dusting was relatively ineffective.

Observations on the susceptibility of the foliage of the potato plant to late blight disease [trans. title], H. L. G. de Bruijn [Bruyn] (*Tijdschr. Plantenziekten, 32 (1926), No. 1, pp. 1–29, pls. 2; Eng. abs., pp. 25–28*).—Though potato varieties differ in susceptibility to late blight, probably no immune varieties exist. Investigations made as to whether existing degrees of susceptibility are due to varietal differences or to other circumstances are described. In 1923 and 1924 it was found that the degree of susceptibility stands in relation with the degree of development of the host. This explains the fact that, in general, early varieties are more susceptible than late ones.

The result of the experiments here noted is that plants of the same potato variety do not appear always to possess the same degree of susceptibility. The degree of resistance is a varietal character, but it also depends upon the degree of development of the plant and upon the external conditions during its growth. These facts must be taken into account when the varietal susceptibility is being determined. For this purpose many observations during different years and at various places are desirable.

Physiological investigation of black heart of potato tuber, W. B. Davis (*Bot. Gaz., 81 (1926), No. 3, pp. 323–338, figs. 7*).—This paper, presenting the results of a physiological study of black heart of the potato tuber, states that

observations were made with the purpose of discovering the nature of the physiological changes which must precede or accompany the profound changes that take place in the interior region which suffers the breakdown and undergoes the color changes known as black heart. It is shown that there is first a rise of resistance in the tissues, extending over a period which varies with the individual tuber at 45° C. (113° F.). This is followed by a continuous fall, beginning with the death of the tissues.

"Color changes similar to or identical with those produced in black heart may be induced in various ways. Probably anything which causes the death of the tissues without destruction of the enzyme involved or alteration of the nature of its substrate may cause the same changes of color in the tissues killed."

Observations on sprain or internal brown spot and net-necrosis of potatoes [trans. title], H. M. Quanjer (*Tijdschr. Plantenziekten, 32 (1926), No. 4, pp. 97–128, pl. 1; Eng. abs., pp. 124–126*).—An observational and bibliographical account is given of potato sprain and net-necrosis, particularly as regards alleged causation of these troubles, with some reference to related or associated disorders.

Susceptibility of potato varieties to wart disease in 1922–1924 [trans. title], J. O. Botjes (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 40 (1925), pp. 25*).—Results are tabulated, with discussion, of tests with domestic and foreign potato varieties as regards their susceptibility to wart disease.

The present state of the problem of control of wart disease of potatoes [trans. title], J. G. Oortwijn Botjes (*Tijdschr. Plantenziekten, 32 (1926), No. 2, pp. 33–44; Eng. abs., pp. 42–44*).—Commenting on the contribution by Roach et al. (E. S. R., 55, p. 653), the author considers the development of resistant varieties as the only practical method of controlling potato wart disease. A number of new potato varieties have been cooperatively tested for wart-disease resistance, and results are detailed as obtained with Triumph. This variety was tested at the potato-testing station at Ormskirk, and all Triumph plants remained healthy during 1924 and 1925.

In 1923 the author found 8 infected potatoes among 1,197 healthy tubers of the variety Triumph at Oostwold. In 1924, 4 of these infected tubers were set near healthy tubers of Triumph on infected soil. Of the progeny of these plants 3 were healthy in 1924, 1 being diseased. In 1925 healthy parts of tubers of the diseased plant were set near tubers of healthy hills on an intensively contaminated soil. All tubers of healthy plants produced healthy plants. Four of the tubers of the diseased plant produced diseased hills, while 7 of them produced healthy plants. Thus 1 plant of the immune variety Triumph has produced a diseased offspring in the years 1923, 1924, and 1925. This plant is perhaps to be regarded as a susceptible bud variation of an immune variety.

The mosaic disease of sugar cane and its control in Jamaica, with a note on streak disease of Uba cane, C. G. Hansford, P. W. Murray, and H. H. Storey (*Jamaica Dept. Agr. Microbiol. Circ. 6 (1926), pp. III+39*).—This circular is in four separate parts: The Mosaic Disease of Sugar Cane, by Hansford; Field Experience in the Control of Mosaic Disease in Jamaica, 1923–25, and A Note on the Uba Cane in Jamaica, both by Murray; and Streak Disease of Uba Cane, by Storey, of Natal.

Mosaic disease of sugar cane (*West India Com. Circ., 39 (1924), No. 678, p. 381*).—Sugar cane mosaic disease in Trinidad, though probably present for some years, was first recognized there in 1920, showing at that time most abundantly in the St. Augustine area but in sporadic instances throughout the

cane-bearing areas. Experiences in attempted control, as briefly stated, would tend to indicate that persistent roguing of fields showing not over 5 per cent infection and replanting with exclusively healthy stock the 20 to 40 per cent canes that are replaced each year will result in cumulative benefit.

Treatment of streak and mosaic diseases, H. H. Dodds (*So. African Sugar Jour., 9 (1925), No. 9, pp. 593, 595, 597, 599*).—Facts regarded as significant in the local situation as bearing upon the present complicated problems of cane varieties in Zululand are presented. The eventual solution of the streak disease problem where it is acute is held to lie in the acclimatization of some cane immune to streak disease. To do this mosaic must first be eradicated, to which end only healthy canes must be planted.

[Sugar cane streak, South Africa, 1925], H. H. Dodds (*So. African Sugar Jour., 9 (1925), No. 9, pp. 753, 755*).—Reference is made to the bulletin by Storey, previously noted (E. S. R., 54, p. 251), with some details of this work and of local conditions leading to the conclusion that only streak-free canes should be planted.

"Although all experiments up to the present comparing the results from streaked and healthy plant canes have become, as stated, more or less rapidly influenced by secondary infection in the originally healthy sections, in every case, that is the three entirely distinct types of soil at Umbogintwini and the series on the alluvial flats at Umhlatuzi (estate of F. Piccione, field station No. 8), the originally healthy plant sections maintain superiority in appearance and growth."

Important fungous diseases of the common sunflower, A. W. Henry and H. C. Gilbert (*Minn. Univ., Studies Biol. Sci., No. 5 (1924), pp. 295–305, pls. 2*).—Among the actual or supposedly potential limiting factors in the production of the increasingly important common sunflower are *Puccinia helianthi-mollis*, *Sclerotinia sclerotiorum*, *Septoria helianthi*, and *Rhysotheca halstedii*. *S. helianthi* has caused a destructive leaf spot of cultivated sunflowers in Minnesota during the past five years. *R. halstedii*, a downy mildew, caused severe stunting of late sown sunflowers at University Farm, St. Paul, in 1923.

Relation of soil temperature and soil moisture to the infection of sweet potatoes by the stem-rot organisms, L. L. Harter and W. A. Whitney (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 435–441, figs. 2*).—Greenhouse experiments to determine the relation between soil temperature and sweet potato infection by the stem rot organisms *Fusarium hyperoxysporum* and *F. batatatis* showed the optimum temperature for infection to lie near 30° C. and the maximum near 35°, infection occurring at the lowest temperatures at which the potato plant could grow. Though the part played by soil moisture on liability to infection proved more difficult to ascertain, infection occurred throughout a wide range of humidity. At 28 and at 75 per cent of the water-holding capacity of the soil 94 and 100 per cent, respectively, of the plants were infected, and infection occurred even in soil having only enough moisture to support potato plant growth.

Healthy plants set in infested soil may become diseased. Wounding increases the infection rate. Some infection occurs when sprouts from healthy potato plants are dipped in spore suspensions. Infection percentage is increased when the sprouts are pulled, both in the sprouts that have been pulled and in those that have been left.

An organism of tomato mosaic, S. H. Eckerson (*Bot. Gaz., 81 (1926), No. 2, pp. 204–209, pls. 4*).—A brief preliminary account is given of work with tomato and other plants affected by mosaic and yielding on examination or after inoculation motile organisms which stain readily. The degenerating effects of these organisms on the chloroplasts are described.

Attempt to cultivate an organism from tomato mosaic, H. A. Purdy (*Bot. Gaz., 81 (1926), No. 2, pp. 210–217*).—In experiments here reported, in which the methods of Olitsky (E. S. R., 53, p. 547) were followed, the author was unable to obtain any evidence that the active agent producing mosaic disease in tobacco and tomato plants multiplies outside the living plants.

Sun scald of tomatoes, R. B. Harvey (*Minn. Univ., Studies Biol. Sci., No. 5 (1924), pp. 229–235, pl. 1, figs. 2*).—Tomato fruit sun scald is said to be caused by high temperatures due to light (heat-energy) absorption. It may show a lessening in severity due to haze, clouds, or slight cooling breezes, or it may show greater injury near the ground owing to soil heat radiation and to higher air temperature at low levels. Greater absorption of heat occurs in the deeper green than in the lighter green of the parts having chlorophyll. Red ripe tomato fruits, on the other hand, may show temperatures as much as 17° F. lower than those shown by green fruits, due to their lower heat energy absorption rate, with a scald percentage in general correspondingly lower. The chlorophyll present in light green areas is supposedly still adequate for the assimilation of sufficient carbon dioxide. It is suggested that breeding a tomato variety which is light green in color at the stem end of the fruits may decrease losses from sun scald, owing to the fact that there is a higher degree of reflection from the light green than from the dark green areas.

Blister and black rot cankers, H. G. Swartwout (*Missouri Sta. Bul. 248 (1927), pp. 15, figs. 13*).—An account in some detail, with summary, is given of apple blister and black rot cankers, which cause great losses in Missouri, being now absent from very few old orchards. Both are, at least primarily, wound parasites in this State. Ben Davis and Gano are very susceptible, and eight others are named as moderately susceptible. Ingram, Jonathan, King David, Rome, Winesap, Arkansas, and Stayman are rather resistant, and Duchess and York are very resistant. Directions briefly detailed include prunings, dressings, and redressings.

A canker of apple and pear trees caused by *Glutinium macrosporum* n. sp., S. M. Zeller (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 489–496, figs. 10*).—A Glutinium found on apple and pear bark in western Oregon was studied. It is claimed to be a new species, and a wound parasite, and is described under the name *G. macrosporum*. It develops a bark canker which extends into the wood. The morphology of the fungus on the host is described, as are also cultural and spore characters developed on artificial media. A fruit rot of apple may be caused by artificial inoculation.

Color pigment in relation to the development of Jonathan-spot, W. T. Pentzer (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 66–69*).—It is claimed that the red color of the apple can be changed to blue by making it less acid, and that such a condition of acid deficiency is found in the spotted region, which accounts for the bluish-black color of Jonathan spot. It is suggested that the acidity of the color-bearing region may be maintained by the use of paper wrappers impregnated with various harmless acids. Several acids, such as boric and others used as impregnators for tissue wraps, were being tried to determine whether during the process of respiration enough of these acids will gain entrance to the fruit to maintain the acidity of the few cell layers of color-bearing tissue.

Soft-scald and breakdown of apples as affected by storage temperature, H. H. Plagge (*Amer. Soc. Hort. Sci. Proc., 22 (1925), pp. 58–66*).—"A study of the storing of Grimes and Jonathan at various temperatures has shown that Grimes is very susceptible to internal breakdown and Jonathan to soft scald at storage temperatures of 30 and 32° F. Internal breakdown did not occur

on Grimes nor soft scald on Jonathan at temperatures of 34, 36, and 40°, or at temperatures of an air-cooled storage house. More breakdown occurred on Grimes and more soft scald on Jonathan at a storage temperature of 30° than at 32°."

Two types of breakdown are supposed to exist, one due to cold and the other to natural deterioration.

"The possibility of controlling soft scald and a type of breakdown of certain varieties of apples by increasing the storage temperatures by a slight margin over the temperatures commonly used in commercial practice is suggested."

Treatment of "roña" in pear [trans. title], J. del Cañizo (*Bol. Estac. Patol. Veg.* [*Inst. Agr. Alfonso XII, Madrid*], *1* (*1926*), *No. 3, pp. 102–105, figs. 4*).—A threatening factor in certain fruit regions of Spain is pear scab (*Fusicladium pirinum*), a conidial form of *Venturia pirina*.

Biologic specialization in Sclerotinia sp., the organism causing brown rot of fruits, J. L. Seal (*Minn. Univ., Studies Biol. Sci., No. 5* (*1924*), *pp. 281–287, pl. 1*).—The evidence is considered as conclusive that there are in England at least two forms of *S. cinerea*, and in the United States at least two and probably more. These biologic forms differ somewhat in their physiology when grown on various substrata under different environmental conditions.

Peach brown rot and scab, J. W. Roberts and J. C. Dunegan (*U. S. Dept. Agr., Farmers' Bul. 1527* (*1927*), *pp. II+14, figs. 6*).—Peach brown rot (*Sclerotinia fructicola* [*S. cinerea*] and scab or black spot (*Cladosporium carpophilum*) both probably occur to some extent wherever peaches are grown. Each is controllable by the use of either sprays or dusts. Directions and schedules are detailed, with information and suggestions as to materials, preparations, and application.

1924 information on winter injury, mosaic and other diseases of raspberries in western Washington, A. Frank (*Wash. State Hort. Assoc. Proc.*, *20* (*1924*), *pp. 128–135*).—The other diseases prevalent in 1924 besides those named in the title were mushroom root rot, rust, crown gall, and bloom and berry blight.

Two important grape diseases, J. C. G. Price and D. C. Neal (*Mississippi Sta. Circ. 68* (*1926*), *pp. 4, figs. 2*).—This account briefly describes grape black rot and anthracnose as to their symptoms and presents, chiefly in tabular form, the methods used for their control at the station and the South Mississippi Substation. These methods include selection for varietal resistance, spraying according to the schedule presented, removal of all infective material, and thorough plowing in early spring.

Effect of spraying with fungicides on the keeping quality of Florida citrus fruits, H. R. Fulton and J. J. Bowman (*U. S. Dept. Agr., Dept. Circ. 409* (*1927*), *pp. 14, figs. 5*).—The present investigation, begun in 1920, had for its object to determine what effect, if any, the spraying of fruit with fungicides has on its keeping qualities.

The results of tests during the six seasons show that citrus fruit from old seedling trees in Florida can be materially improved as regards keeping quality by spraying once between April 15 and May 5 with 3-3-50 Bordeaux mixture plus 1 per cent of oil emulsion, this being the regular treatment for melanose control. By this means half or more of the Phomopsis type of stem end rot was prevented over a prolonged holding period, the reduction of Diplodia stem end rot being about one-fifth, and blue mold rot and several minor rots not being materially affected. The combined effectiveness against all rots amounted to a reduction of about one-third.

[A disease of] coconuts at Cedros, Trinidad (*West India Com. Circ.*, *39* (*1924*), *No. 684, p. 506*).—A peculiar outbreak, at first appearing to be an

epidemic disease, was noted on several properties in the Cedros district. Trees in blocks of from 8 to 20 suddenly sickened and died. The most severely affected trees, with stems bleeding and foliage browned, quickly developed bud rot.

Preliminary account of the outbreak of Septobasidium bogoriense and S. rubiginosium on tea [trans. title], A. STEINMANN (*Thee* (*Alg. Proefsta. Thee* [*Buitenzorg*]), *7* (*1926*), *No. 2*, *pp. 52, 53*, *pl. 1*).—*S. bogoriense* and *S. rubiginosum* are compared.

Black canker of chestnut [trans. title], J. DUFRENOY (*Min. Agr.* [*France*], *Ann. Off. Agr. Région. Sud-Ouest*, *No. 10* (*1925*), *pp. 79–96*, *pl. 1*, *figs. 18*).—Since 1882 chestnuts have been subject to a disease working chiefly, or at least primarily, in the roots and crown. This blackening or inky disease is described as to the presence or relations therewith of a fungus, *Blepharospora cambivora*.

Gloeosporium hysterioideum Dear. and Barth., a leaf disease of Acer saccharum Marsh., J. M. VAN HOOK (*Ind. Acad. Sci. Proc.*, *41* (*1925*), *pp. 232, 233*).—Observations mainly on a leaf disease of hard maple trees in a deep hollow of a practically virgin forest in southern Indiana are outlined, with publication of what is intended to stand as the original description of the associated fungus, *G. hysterioideum*.

Walnut diseases [trans. title], M. GARD (*Min. Agr.* [*France*], *Ann. Off. Agr. Région. Sud-Ouest*, *No. 10* (*1925*), *pp. 54–78*, *figs. 7*).—The author has studied for some years in walnut, and herein discusses principally two diseases, a trunk rot due to *Armillariella mellea*, and a root disease showing incomplete analogy with one named in Europe mal nero or bacillary gummosis. He also briefly describes the progress since 1922 of a disease limited apparently to young walnuts in certain sections, and associated often with one or more of the fungi *Schizophyllum commune*, *Nectria cinnabarina*, and *Melanconium juglandinum*.

Rhizosphaera kalkhoffii Bubák, as a cause of defoliation of conifers, M. WILSON and J. S. L. WALDIE (*Roy. Scot. Arbor. Soc. Trans.*, *40* (*1926*), *pt. 1*, *pp. 34–36*, *pl. 1*, *fig. 1*).—Defoliation of spruce (*Picea pungens argentea* and *P. sitchensis*), which has become a serious problem in Scotland, was found in 1922 and 1923 to be associated with *R. kalkhoffi*, which was later found on *P. excelsa*, *P. nigra*, *P. alba*, *P. orientalis*, *P. schrenkiana*, *Abies pectinata*, *A. nobilis*, *Pseudotsuga douglasii*, *Pinus austriaca*, and *P. montana*. This fungus is thought to have been introduced from Europe on the glaucous varieties of *Picea pungens*.

Rhabdocline pseudotsugae Syd., a new disease of the Douglas fir in Scotland, M. and M. J. F. WILSON (*Roy. Scot. Arbor. Soc. Trans.*, *40* (*1926*), *pt. 1*, *pp. 37–40*, *pl. 1*, *fig. 1*).—*R. pseudotsugae* is supposed to have been introduced into southern Scotland before 1914, first producing serious effects on Douglas fir about 1922. It attacks trees about 15 years old of two Douglas fir varieties, here classified provisionally as *Pseudotsuga glauca* and *P. douglasii caesia*. The development of the organism is described.

Peridermium kurilense Diet. on Pinus pumila Pall., and Peridermium indicum n. sp. on Pinus excelsa Wall., R. H. COLLEY and M. W. TAYLOR (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 4*, *pp. 327–330*, *fig. 1*).—Peridermiums now known to attack stems of five-leaved or white pines are said to include only *P. strobi* (*Cronartium ribicola*) on *P. strobus* and other pines named, *P. kurilense* on *P. cembra pumila*, and *P. indicum* on *P. excelsa*. *P. strobi* is well known in this country as to its life history, morphology, and parasitism, and the other two, it is thought, may also prove injurious if introduced. These are therefore described. *P. kurilense* was studied on twigs of *P. cembra pumila* from the Kurile Islands, Japan. *P. indicum*, which was studied on twigs and

branches of *P. excelsa* from Kulu, northwest Himalaya, India, is regarded and treated as a new species.

Conditions antecedent to the infection of white pines by Cronartium ribicola in the northeastern United States, P. Spaulding and A. Rathbun-Gravatt (*Phytopathology, 15 (1925), No. 10, pp. 573–583, figs. 5*).—This is largely a collection by the authors of observations not previously published, but made in the course of recent studies, some of which have been noted (E. S. R., 47, p. 154). Information regarding the influence of weather conditions and other factors on infections is credited to closely related studies by York and Snell (E. S. R., 48, p. 648; 50, p. 753).

In the present article an account is given of certain factors influencing the period of production of telia by *C. ribicola*, namely, weather conditions, time of season that the Ribes drop their leaves, and the varying ability of the species of Ribes to produce a second crop of leaves after the first has been dropped. Teliospore germination is especially dependent upon moisture, but not ordinarily so much upon temperature alone, though low temperatures may check or inhibit germination. High temperatures were not tested. Aging increased the germination period as regards newly matured teliospores. Longevity (viability) of teliospores is influenced by Ribes (host) habitat and Ribes leaf structure, both of these being closely associated with moisture access. Some of the numerous factors for white pine infection by *C. ribicola* are still unknown. It is certain that germination requires a period of moisture and that this must be followed by one of high humidity for infection.

Inoculation of Pinus strobus trees with sporidia of Cronartium ribicola, W. H. Snell and A. Rathbun-Gravatt (*Phytopathology, 15 (1925), No. 10, pp. 584–590, figs. 2*).—An account is given of the method used in inoculating large *P. strobus* trees with *C. ribicola* at North Conway, N. H., in 1922. In 1924, 18 out of the 51 trees inoculated in moist chambers had become diseased, and 20 of the 144 branches had cankered. Six of 9 trees inoculated under natural conditions without subsequent moist chambering had become diseased, and 11 of the 53 branches thus inoculated had cankered in 1924. The possibility of future infections appearing is discussed. No infection had occurred in small *P. resinosa* trees in 1924.

A partial explanation of the relative susceptibility of the white pines to the white pine blister rust (Cronartium ribicola, Fischer), P. Spaulding (*Phytopathology, 15 (1925), No. 10, pp. 591–597*).—This paper deals in tabular and descriptive detail with white pines and piñon pines in relation to blister rust, particularly as regards their relative (estimated) susceptibility, leaf persistence, stomatal numbers, and distribution, and the thickness of the inner bark. Attention is called to the several characters and marked similarity of *Pinus strobus* and *P. monticola*, within which two species only of pine is blister rust epidemic in North America. The modes of killing in these two are contrasted. Vigorous growth and thick inner bark seem to favor the fungus, as probably does also the condition of a larger number and wider distribution of leaf stomata.

The results of inoculating Pinus strobus with the sporidia of Cronartium ribicola, H. H. York, W. H. Snell, and A. Rathbun-Gravatt (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 497–510, pl. 1, figs. 3*).—During the field investigations of white pine blister rust which the U. S. D. A. Office of Forest Pathology conducted at North Conway, N. H., from 1918 to 1922, *P. strobus* in large numbers was inoculated with sporidia of *C. ribicola*, as noted above. In the present paper the results of the 1921 and 1922 inoculations of potted

pines and the 1925 observations on the 1922 inoculations of pines in situ are reported.

Infections occurred at rather high relative humidities and at medium temperatures. Extremes have not been determined. Sporidia from *Ribes cynosbati*, *R. odoratum*, and *R. nigrum* (other Ribes not tested) infected both seedlings and trees. External symptoms and sectioning showed 1- and 2-year-old needles of *P. strobus* to be equally susceptible to sporidia of *C. ribicola*. Canker developed on wood formed in the season of inoculation as well as that formed in the preceding season. Infection was confirmed 3 months after inoculation. Potted seedlings of the current year, as well as older ones, became infected. Some infected potted seedlings died 1 year after inoculation. Only a few of the infections had resulted in pycnia or aecia 3 years after inoculation.

A morphologic and biometric comparison of Cronartium ribicola and Cronartium occidentale in the aecial stage, R. H. Colley, C. Hartley, and M. W. Taylor (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 511–531, figs. 5*).—Since the piñon blister rust (*C. occidentale*), described by Hedgcock, Bethel, and Hunt (E. S. R., 39, p. 858), was shown to be widespread in certain western States, the question of its actual distinctness from *C. ribicola* has been debated. A recent study by Colley (E. S. R., 53, p. 347) was claimed to show distinctions between the fungi as above named. The purpose of the present paper is to submit the evidence of morphologic and biometric differences (claimed to be significant and easily recognized) in the aecial stages. The differences are detailed.

Seed dissemination of Nematoda, W. E. H. Hodson (*Nature [London], 116 (1925), No. 2908, p. 135*).—While studying the relations of *Tylenchus dipsaci* to the oat (seed), the author noted the occurrence also of various other nematodes between the palets, among these species of Tylenchus, Diplogaster, and Cephalobus. Some correlation was apparent between such occurrence and the relatively poor development of the plant. It is supposed that dissemination by way of seed should be regarded as one of the normal ways in which nematodes are spread. It is thought that loss may result from this relation.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The rôle of vertebrates in the control of insect pests, W. L. McAtee (*Smithsn. Inst. Ann. Rpt. 1925, pp. 415–437, pls. 7*).—This is a contribution from the U. S. D. A. Bureau of Biological Survey.

The beaver: Its work and its ways, E. R. Warren (*Amer. Soc. Mammal. Monog. 2 (1927), pp. XX+177, pl. 1, figs. 78*).—In this work on the beaver, observations of its life history and habits are included. A bibliography of about 4 pages is given.

The Migratory Birds Convention Act and Federal regulations for the protection of migratory birds (*Ottawa: Canada Dept. Int., 1926, pp. 34*).—This is a compilation of the act and regulations relating to the protection of migratory birds in Canada.

Wild birds in city parks, H. E. and A. H. Walter (*New York: Macmillan Co., 1926, 12. ed., rev., pp. 111, pl. 1, fig. 1*).—This is a practical account, adapted particularly to use in Lincoln Park, Chicago, which deals with some 200 birds that may be observed in cities in the northeastern United States and Canada. In addition to brief descriptions of the birds the work includes a key for use in their identification, tables of their arrival and frequency in Lincoln Park, a graph showing the height of migration, a table of distribution and occurrence, lists of species extinct or nearly so, introduced species and hybrids, index to common names, and an insert for use as a spring migration chart.

Directory to the bird-life of the San Francisco Bay region, J. GRINNELL and M. W. WYTHE (*Cooper Ornithol. Club, Pacific Coast Avifauna No. 18 (1927), pp. 160, pl. 1, fig. 1*).—A systematic list is given of the species and subspecies (pp. 21–34) and a general directory of forms met with (pp. 35–149), including 383 species and subspecies.

Life histories of North American marsh birds: Orders Odontoglossae, Herodiones, and Paludicolae, A. C. BENT (*U. S. Natl. Mus. Bul. 135 (1926), pp. XII+490, pls. 98*).—This is the sixth of a series of bulletins on the life histories of North American birds (E. S. R., 54, p. 52).

The birds of central Europe, O. and M. HEINROTH (*Die Vögel Mitteleuropas. Herausg. Staatl. Stelle für Naturdenkmalpflege in Preussen. Berlin-Lichterfelde: Hugo Bermühler, 1924–1926, vols. 1, pts. 1–33, pp. VIII+339, pls. 193, fig. 1; 2, pts. 34–39, pp. 48, pls. 62; rev. in Science, 65 (1927), No. 1676, pp. 164, 165*).—This is a descriptive account of the birds of Germany and neighboring countries, including original observations of their life histories. Several of the plates are in colors. The review of the first ten parts is by H. C. Oberholser.

Parrakeets, D. SETH-SMITH (*London: Bernard Quaritch, 1926, rev. ed., pp. XXVIII+295, pls. 20, figs. 24*).—Descriptions are given of 162 species of parrakeets belonging to the Loriidae, Cacatuidae, and Psittacidae. Colored plates are given of many of the forms.

The eradication campaign against the white snail (Helix pisana) at La Jolla, California, A. J. BASINGER (*Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 2, pp. 51–76, figs. 23*).—Reporting further extermination work with this pest (E. S. R., 50, p. 657), it is stated that experiments have shown calcium arsenate and bran to be a satisfactory poison. The use of poison bait, plus a program of inspection, quarantine, clearing the ground with hoes, burning, and hand picking makes the prospects of eradication very hopeful.

On the morphology of the adults and the free living larvae of Dictyocaulus arnfieldi, the lung-worm of equines, T. W. M. CAMERON (*Jour. Helminthol., 4 (1926), No. 2, pp. 61–68, figs. 2*).—This is an account of a parasite recorded from Europe, North and South America, and Australia which is easily overlooked since it frequently causes no symptoms in the host animal.

Communism among the insects, E. L. BOUVIER (*Le Communisme chez les Insectes. Paris: Ernest Flammarion, 1926, pp. 291, figs. 24*).—The several parts of this work deal with the nature of the communistic society of insects (pp. 9–84), its genesis and evolution (pp. 85–168), and its mechanism (pp. 169–284).

Insect attack and the internal condition of the plant, A. H. LEES (*Ann. Appl. Biol., 13 (1926), No. 4, pp. 506–515*).—This discussion of the subject includes a list of 19 references to literature.

The problem of host relations with special reference to entomophagous parasites, W. R. THOMPSON and H. L. PARKER (*Parasitology, 19 (1927), No. 1, pp. 1–34*).—In the main part of this account the authors deal with the choice of the normal host. They consider host selection in *Melittobia acasta* Walk. and *Compsilura concinnata* Meig., host selection and systematic affinity, and host selection and morphological resemblance and morphological identity. They give a summary of the facts bearing on host selection and significance of the data, the true nature of the problem, and host selection as a psychological problem.

Beneficial insects trapped in bait-pails, S. W. FROST (*Ent. News, 38 (1927), No. 5, pp. 153–156, fig. 1*).—This contribution from the Pennsylvania Experiment Station reports briefly upon captures made of the oriental fruit moth (*Laspeyresia molesta* Busck) in bait pails. The results obtained show that bait pails can be used satisfactorily without attracting beneficial insects in alarming numbers.

Investigations into insecticides for root mealy bug and root aphis, W. H. SAUNDERS (*Ann. Appl. Biol., 13 (1926), No. 4, pp. 495–501*).—In the author's investigations tetrachlorethane (Westoran), trichlorethylene (Westropol), and potassium sulfocarbonate were found to be the most effective and suitable insecticides for this purpose. The root mealy bug and root aphid, living under similar conditions in pots and adopting similar methods of feeding and protection, respond similarly to any particular treatment.

Effect of soil microorganisms on paraffin used as a coating to decrease the injurious action of lead arsenate on plant roots, W. E. FLEMING (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp. 335–338*).—In continuation of investigations reported by Leach (E. S. R., 55, p. 552), the author conducted investigations of soil microorganisms which have shown that they possess the ability to decompose the various oils, fats, waxes, and paraffin used by Leach to decrease the injurious action of lead arsenate on certain plant roots. Coating lead arsenate with these substances did not decrease the injurious action of the insecticide in the soil or reduce its toxic effect on plants. It was found that the soil fungi were stimulated by the paraffin, and that soil bacteria were less active than the fungi in decomposing the paraffin coating. It is thought that the conversion of the paraffin coating into organic acids may explain the injurious action of the coated insecticide in the soil.

The determination of arsenical residues on apple foliage, F. A. HERMAN and A. KELSALL (*Sci. Agr., 7 (1927), No. 8, pp. 290, 291*).—In the studies reported the lead arsenates in admixture with lime sulfur show superior adhesion to calcium arsenate in lime sulfur. The arsenicals when incorporated in the aluminum sulfate-lime sulfur mixture have a greater persistence to foliage than when incorporated in the straight lime sulfur mixture. The adherence of calcium arsenate in the aluminum sulfate-lime sulfur mixture is comparable to that of dry lead arsenate, but superior to paste lead arsenate. In Bordeaux mixtures, calcium arsenate is more tenacious to foliage than any of the arsenicals in lime sulfur.

A list of the insect types in the collections of the Illinois State Natural History Survey and the University of Illinois, T. H. FRISON (*Ill. Nat. Hist. Survey Bul., 16 (1927), Art. 4, pp. 137–309*).—Following a brief introduction, the types in the collection of the Illinois State Natural History Survey are listed by order and family (pp. 142–231), followed by a list of the types in the Andreas Bolter collection of insects of the Natural History Museum, University of Illinois (pp. 232, 233), and the types in the A. D. MacGillivray collection of Tenthredinoidea of the department of entomology, University of Illinois (pp. 234–268). An index is given of the scientific names referred to in this article, including the orders, families, genera, and species.

Insects captured in the lookout stations of New Jersey, H. B. WEISS (*N. J. Dept. Agr. Circ. 106 (1927), pp. 21, figs. 5*).—The collections made are recorded in tabular form by orders and families, and detailed records of captures identified follow.

Insect and other pests of 1923, R. S. MACDOUGALL (*Highland and Agr. Soc. Scot. Trans., 5. ser., 36 (1924), pp. 100–140, figs. 26*).—An account is given of the more important pests of 1923 in Scotland.

[**Insect control**] (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1925), No. 2, pp. 97–230, figs. 20*).—Papers are presented on The Practical Importance of the Parasite *Trichogramma evanescens* Westw., by H. Voelkel (pp. 97–108); Carbolineum in the Orchard, by J. Houben and G. Hilgendorff (pp. 109–162); Further Investigations of the Biological Control of the Mediterranean Flour Moth by Aid of Parasites (pp. 163–169) and Contribution to the Life History

of *Trichogramma evanescens* Westw., (pp. 171–224), both by A. Hase; and a Contribution to the Morphology of *Trichogramma evanescens* Westw., by U. Hintzelmann (pp. 225–230).

The insects of Australia and New Zealand, R. J. TILLYARD (*Sydney: Angus & Robertson, 1926, pp. [XV]+560, pls. 44, figs. 475; rev. in Agr. Gaz. N. S. Wales, 38 (1927), No. 2, p. 166; Ann. Appl. Biol., 14 (1927), No. 2, pp. 255–257; Science, 65 (1927), No. 1685, pp. 374, 375*).—This is a work intended primarily as a textbook for use in Australia and New Zealand. The chapters first presented deal with classification and census, external morphology, internal morphology, and life history. The 24 chapters which follow are devoted to as many orders; then follows a chapter on fossil record and origin of the Australian and New Zealand insect faunas and one on collection, preservation, and study of insects. A bibliography is given at the end of many of the chapters. A glossary and abbreviations of authors' names are appended.

The rise and progress of entomology in India, T. V. RAMAKRISHNA AYYAR (*Jour. Madras Agr. Students' Union, 15 (1927), No. 1, pp. 7–18*).—This is a brief review of entomology in India, including a list of dates of some early entomological publications.

Observations on the insect carriers of mosaic disease of the potato, K. M. SMITH (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 113–131, pls. 3, fig. 1*).—This is an account of preliminary experiments with insects as transmitters of potato mosaic disease, in which 3 aphids, 1 aleyrodid, 2 capsids, and 2 typhlocybids were employed. In conducting this work infected insects were placed both upon the sprouts of tubers and upon the haulm, the latter being the only satisfactory method for insects other than aphids. Successful transmission of mosaic disease was obtained in 1925 by means of the aphids *Myzus persicae* and *Macrosiphum gei*. Some evidence of infection by means of the greenhouse whitefly and the leafhoppers *Zygina pallidifrons* and *Eupteryx auratus* was also obtained, but further work with these insects is necessary before final conclusions can be drawn. The capsid bugs *Lygus pabulinus* and *Calocoris bipunctatus* failed entirely to transmit the disease.

Forest entomological investigations [trans. title], H. GASOW (*Arb. Biol. Reichsanst. Land u. Forstw., 15 (1926), No. 1, pp. 75–98, figs. 7*).—These notes relate to work with the green oak tortrix (*Tortrix viridana* L.) and the pine geometrid (*Bupalus piniarius* L.).

The conquest of disease, T. B. RICE (*New York: Macmillan Co., 1927, pp. X+363, pl. 1, figs. 62*).—This work includes an account of insect-borne diseases (pp. 223–259).

Suggestions for the control of termites or white ants in buildings, W. H. PATTERSON (*Gold Coast Dept. Agr. Bul. 1 (1925), pp. 17, pls. 2*).—This is an account of control measures by the Government entomologist of the Gold Coast Colony.

A technic for use with homopterous vectors of plant disease, with special reference to the sugar-beet leaf hopper, Eutettix tenellus (Baker), W. CARTER (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 449–451, fig. 1*).—This is a description of methods devised during the course of studies of the sugar beet leafhopper, *E. tenellus* (Bak.), in its relation to curly top.

An animal mesentery sold under the name of "fish skin" was fitted over a glass tube containing a food solution upon which the insect feeds. For the feeding of a large colony a small sack made of the membrane was filled and hung free in the cage.

In the course of this work the author has successfully transmitted the infection from juice expressed from diseased beets to noninfective leafhoppers

and thence to healthy beets by means of the technique described. Similar positive results have been obtained by H. H. Severin of the California Experiment Station. It is pointed out that since extracted juice rapidly loses its original character and becomes toxic to the insect, it is not safe to feed *E. tenellus* on such juice for more than two or three days at 70° F. Tap water or weak sugar solutions were the substances on which the author was able to sustain the life of the insects for the longest periods, *E. tenellus* being fed for two weeks on a dilute sugar cane solution, while one specimen of *Geocoris bullatus* Say was kept alive for a month on tap water.

A leafhopper (Eupteryx flavoscuta var. nigra Osb.) attacking the leather-leaf fern (Polystichum capense J. Sm.), O. C. McBride (*Fla. State Hort. Soc. Proc., 39 (1926), pp. 224–227*).—The leafhopper *E. flavoscuta nigra* Osb. has become a source of injury to leather-leaf fern in Florida, one grower having suffered a loss of over $2,000 in 8 months. In control work reported nicotine-lime dust and calcium cyanide dust did not give satisfactory results, and the latter caused slight injury to the ferns. Nicotine sulfate 1:800 plus soap did not kill the last two nymphal stages and the adults. Five per cent extract of derris 1:800 and 1:600 gave satisfactory control, but was slow in becoming effective. The fernery was free, however, from leafhoppers for 13 days after the application of derris. A second application of nicotine sulfate gave 75 to 80 per cent control, whereas 5 per cent extract of derris gave 98 to 99 per cent.

Control and spring emergence of the cotton flea hopper, H. J. Reinhard (*Texas Sta. Bul. 356 (1927), pp. 32, figs. 10*).—The first part of this bulletin reports experiments on control of the cotton flea hopper (E. S. R., 55, p. 458) during the season of 1926. The average daily control secured in the tests with superfine dusting sulfur, flowers of sulfur, Niagara sulfur-naphthalene, 60:20:20 sulfur-tobacco dust-lime, and 60:40 sulfur-tobacco dust ranged from 68.2 to 75.9 per cent. When applied at the rate of 20 lbs. per acre they remained effective in controlling the insects for a period of 6 or 7 days under favorable climatic conditions. In a series of 3 preliminary tests contact sprays including Derrisol, Insecto-Spray, Pyrethol, Sulfocide, Boll-We-Ex, and lime sulfur were less effective than the dusts. The first application of dust should be made at the time when the cotton plants would normally begin to form squares, using 15 to 20 lbs. per acre of superfine dusting sulfur or flowers of sulfur. It is recommended that the dust be applied every seventh day until the cotton plants have a set crop of fruit, and if washed off by rains within 4 or 5 days the application should be repeated. The dusts may be applied at any time during the day, but preferably when there is little or practically no air movement.

The report of control work is followed by an account of studies of the spring emergence of the pest during 1926. The emergence extended over a period of more than 13 weeks, beginning March 7, although 73 per cent of the emergence occurred between April 5 and April 26, and it was practically completed by May 17.

Sixteen additional food plants, including principally early spring weeds growing in and adjacent to fields of young cotton, are recorded.

The influence of parentage, nutrition, temperature, and crowding on wing production in Aphis gossypii Glover, H. J. Reinhard (*Texas Sta. Bul. 353 (1927), pp. 19*).—Following a review of literature, the author reports upon the effect of parentage, nutrition, temperature, and crowding, and observations on the effect of humidity on wing production in *A. gossypii* Glover. They find that the normal tendency in this aphid is to produce offspring which do not develop wings, the production of wings being dependent entirely upon environ-

mental influences. Starvation increases the number of winged forms in the progeny produced by apterous parents. The offspring of alate parents revert to the normal tendency of the species, namely, the apterous form, with such puissance, that the effect produced by starvation in stimulating wing development is practically if not entirely counteracted. Temperature within the limits of 70 to 90° F. does not affect the ratio of forms produced in this species. Crowding is a very potential, if not the dominant or controlling factor, in stimulating wing development in *A. gossypii*. There is no correlation between the prevailing relative humidity in which the aphids are reared and the ratio of alate to apterous forms produced.

Carnivorous butterflies, A. H. Clark (*Smithsn. Inst. Ann. Rpt. 1925, pp. 439–508, figs. 5*).—This is a summary of information on the subject.

Control work with the green oak tortrix (Tortrix viridana L) by use of the power duster [trans. title], H. Gasow (*Arb. Biol. Reichsanst. Land u. Forstw., 15 (1926), No. 1, pp. 99–107, pls. 4, figs. 3*).—A brief account of dusting work.

Studies on the biology of the pecan nut case bearer (Acrobasis caryae, Grote), S. W. Bilsing (*Texas Sta. Bul. 347 (1927), pp. 71, figs. 15*).—The author records observations of the life history of this case bearer and considers the anatomical characters which differentiate it from closely related insects. The account is in continuation of, and deals more particularly with its biology than, Bulletin 328 (E. S. R., 55, p. 855). During the years 1919, 1921, and 1923 four generations were observed by the author, while in 1918, 1920, and 1922 there were but two.

The European corn borer, H. G. Crawford and G. Maheux (*Quebec Dept. Agr. Bul. 92 (1927), pp. 16, figs. 9*).—This is a practical account.

Biology of the European corn borer (Pyrausta nubilalis Hübn.) and two closely related species in northern Ohio, F. W. Poos (*Ohio Jour. Sci., 27 (1927), No. 2, pp. 47–88, pls. 6, figs. 3*).—This is a report of studies of the life history and bionomics of the European corn borer and the closely related species *P. ainsliei* Heinr. and *P. penitalis* Grote, with notes on their parasitic enemies.

Dispersion of the Angoumois grain moth to wheat fields, P. Simmons and G. W. Ellington (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 459–471*).—The authors conclude that the principal moth sources which cause preharvest infestation of wheat in the eastern wheat region are ear corn and wheat in straw, bins, and litter from mows. Field infestation of the wheat crop in fields near sources of moths is the rule rather than the exception, and the percentage of infestation decreases as the distance from moth sources increases. The percentage of infestation in the field is low, but an infestation of 0.26 per cent indicates a moth population of about 28,500 per acre (owing to the rapidity of increase of the Angoumois grain moth, these early infestations develop into destructive outbreaks when weather conditions are favorable). If preharvest infestation were eiminated, the severe and widespread damage now caused by the insect would be a thing of the past.

Codling moth traps, A. Spuler (*Washington Col. Sta. Bul. 214 (1927), pp. 12, figs. 4*).—In investigations conducted during the year 1926 the author found the codling moth to be attracted in large numbers to a bait of fermented apple juice. In the experiments 2,418 moths were caught in 33 fruit jars, or an average of 73.3 per jar, while during the same period 13,951 moths were caught in 54 mush bowls, or 258.3 per bowl. The material used consisted of apple cider 1 gal., brown sugar 0.5 lb., and yeast 1 cake. It was found that codling moths do most of their flying in tree tops, and traps placed in the extreme top catch more of them than when placed in any other position in the trees. Traps

so placed caught 12.5 times as many as those near the ground and about 5 times as many as those 12 to 15 ft. above the ground, the trees in the experimental orchard averaging from 20 to 25 ft. in height. During the season 17,429 moths were caught in less than 100 traps in a 6-acre orchard, over 15,000 of these being caught in 60 traps using the mush-bowl type of container. Approximately 60 per cent of the moths caught were females. It is concluded that these traps, the cost of maintaining which did not exceed 25 cts. per tree per season, will reduce the number of moths in an orchard, thus serving as an important supplement to spraying, and furnish information as to the time of appearance of the moths.

Controlling the epidemic of apple worms, L. HASEMAN and K. C. SULLIVAN (*Missouri Sta. Bul. 250 (1927), pp. 16, figs. 10*).—In this bulletin the authors point out that in the past two years fruit growers have not been effectively controlling the codling moth in Missouri, the unusual damage being due to favorable natural conditions, abnormal life cycle of the pest, and lack of spray coverage at the times needed. They point out that observations properly conducted will alone enable the grower to know when each application should be made and how long to continue the spray for each brood of worms. They place emphasis on the proper timing of the different applications and on the thoroughness with which they are made. An increase in the amount of arsenic is recommended in the cover sprays for the first-brood worms.

Studies on the bionomics of North American anophelines.—I, The number of annual broods of A. quadrimaculatus, M. F. BOYD (*Amer. Jour. Hyg., 7 (1927), No. 3, pp. 264–275, figs. 4*).—This is a report on studies of collections made in North Carolina and Georgia.

How oil kills anopheline larvae, H. P. HACKER (*Fed. Malay States Malaria Bur. Rpts., 3 (1925), pp. [3]+62, pls. 2, figs. 2*).—In this account the author considers the appearances seen in larvae killed by contact with oil, some effects of differential wetting, the effect of water on the killing power of oil, the effect of oil vapors, some conditions affecting the spread of oil on water, and the relation between the spreading power of oils and their toxicity.

Tritoxa flexa Wied., the black onion fly (Ortalidae, Dipt.), F. H. CHITTENDEN (*Canad. Ent., 59 (1927), No. 1, pp. 1–4, fig. 1*).—The author points out that while this fly is a native species, observed to be an enemy of onions as early as 1865, it has not proved to be a pest of great importance. Notes and records of injury, some unpublished, are given.

Parasite of the larva of the tomato worm moth (Protoparce quinquemaculatus, H. M. HEFLEY, JR. (*Okla. Acad. Sci. Proc. [Okla. Univ.], 5 (1925), pp. 77–80*).—This is a brief account of the red-tailed tachinid (*Winthemia quadripustulata*).

Porto Rican cane-grubs and their natural enemies, H. E. BOX (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 4, pp. 291–356, pls. 2, figs. 19*).—This is a summary of information on white grubs attacking sugar cane and observations on their natural enemies. A list is given of 16 references to literature. Lists of the Porto Rican cane grubs and their scoliid parasites, where known, and the Porto Rican scoliid wasps and their hosts, where known, are given in the first appendix (pp. 354, 355), followed by a list of the Scoliidae of the West Indies and British Guiana (pp. 355, 356).

Experimental control of May beetles with arsenical dust [trans. title], H. SACHTLEBEN (*Arb. Biol. Reichsanst. Land. u. Forstw., 15 (1926), No. 1, pp. 19–46, pls. 3, figs. 2*).—This is a report of control work with adult beetles.

The white pine weevil problem in the New England States, H. J. MACALONEY (*N. Y. State Col. Forestry, Syracuse Univ., Forest Protect. Conf. Papers,*

1926, pp. 31–43, figs. 4).—An account is given of the nature of attack and injury caused by this pest in the New England States, and control measures applicable.

Experiments on the control of the plum curculio, brown rot, and scab, attacking the peach in Georgia, O. I. SNAPP, C. H. ALDEN, J. W. ROBERTS, J. C. DUNEGAN, and J. H. PRESSLEY (*U. S. Dept. Agr. Bul. 1482 (1927), pp. 32, figs. 10*).—The authors here report upon spraying and dusting experiments conducted in the Georgia peach belt during the years 1921 to 1924, inclusive.

They find that the application of arsenate of lead when 75 per cent of the petals have fallen materially reduces the curculio infestation in the small peaches that drop to the ground before maturing. In the frequent seasons in which there are two generations of the curculio this treatment has a substantial effect in reducing the infestation in the peaches harvested. An application of arsenate of lead, made four weeks before mid season or late varieties of peaches are due to ripen, is considered indispensable if the curculio is to be satisfactorily dealt with in the South. Arsenate of lead, used at the rate of 0.75 lb. to each 50 gal. of water, is not so effective against the curculio as when used at the rate of 1 lb.

The insecticidal action of triplumbic arsenate of lead is too slow for best results in controlling the curculio. The diplumbic arsenate should always be used (E. S. R., 47, p. 440). The addition of calcium caseinate did not increase the effectiveness of arsenate of lead or that of self-boiled lime-sulfur in controlling the pests that attack the peach fruit. The mixture of sulfur, hydrated lime, and calcium caseinate, tested in combination with arsenate of lead, gave good results in controlling brown rot and scab, but under the conditions prevailing in central Georgia the mixtures tested resulted in injury to the foliage sprayed and in one year in complete defoliation.

Dust containing 10 per cent of arsenate of lead gave no better control of the curculio than did the dust containing only 5 per cent, and resulted in more burning of the foliage. A dust composed of 80 per cent of sulfur and 20 per cent of lime, when applied 7 to 10 days before harvest as an auxiliary to the usual spray, did not diminish infections of brown rot and scab, but nevertheless might be desirable in very moist seasons.

Low temperature and moisture as factors in the ecology of the rice weevil, Sitophilus oryza L. and the granary weevil, Sitophilus granarius L., W. ROBINSON (*Minnesota Sta. Tech. Bul. 41 (1926), pp. 43, figs. 23*).—The author gives a description of the methods and equipment used in experiments conducted.

In a series of abrupt exposures, where the temperatures were dropped suddenly, there was a well marked correlation between length of exposure and percentage of mortality, and this was true for every temperature used. Both species are unable to endure dormancy, oryza becoming dormant at approximately 7.2° C. (45° F.) and granarius at 1.6° C. (35° F.); and in this condition they will perish in 17 and 38 days respectively. During exposure to low temperatures, a continuous loss of weight occurs with each species, and this loss is regular and constant. The gradual approach of cold weather, which "hardens" hibernating insects and enables them to survive the very low temperatures of winter, has the opposite effect upon grain weevils (and probably the whole group of nonhibernating insects) and causes death to occur more rapidly.

Optimum, maximum, and minimum moisture content of wheat required by grain weevils was investigated. Oryza is more sensitive to dryness in wheat than granarius, but neither can endure a moisture content as low as 8.2 per

cent. Probably 14.0 per cent is necessary for oryza, while granarius can exist upon 12.5 per cent or slightly less. The optimum has not been definitely ascertained, but is possibly around 17.5 per cent. The maximum is probably not more than 25 per cent, for above that amount a complication sets in by the production of carbon dioxide through increased respiration which is injurious to the weevils.

Experiments on the mating of queen bees, J. TINSLEY (*West of Scot. Agr. Col. Bul. 105A (1926), pp. 8*).—The experiments tend to show that, provided no other drones are admitted to a colony of bees, the virgin queen will mate with her own drones, and it is therefore possible to bring about pure mating or the crossing of queens with any other variety of the same type.

Winter protection for the honey bee colony, H. F. WILSON and V. G. MILUM (*Wisconsin Sta. Research Bul. 75 (1927), pp. 47, figs. 17*).—In the work here reported the authors have followed the method developed and used by Phillips and Demuth (E. S. R., 31, p. 254), using a series of electrical thermocouples placed in standard ten frame hives and so arranged that a reasonably accurate record of the location and activities of each colony could be secured at all times. The records were made during practically all conditions of weather and temperature, the readings in 1922–23 extending from December 15 to April 11 and in 1923–24 from November 28 to April 10. In the first part of the report a detailed account is given of the apparatus employed. This is followed by accounts of the general location of experimental colonies, activity of the honeybee cluster in winter, and insulation values for the honeybee colony in winter and spring. The account concludes with a report of studies of the comparative values of straw, leaves, clover chaff, and shavings as insulation materials. The data are presented in large part in tabular and graph form.

In the comparative study of experimental materials balsam wool was found to be the most efficient insulator for this purpose of all the materials tested. Wheat straw came next in order, and, when cost and availability are considered, is, in the authors' opinion, the proper material for beekeepers to use.

The poisoning of honey bees by orchard sprays, A. I. BOURNE (*Massachusetts Sta. Bul. 234 (1927), pp. 73–84, figs. 2*).—In this account the author reports first upon laboratory experiments (pp. 74–77) and then upon orchard experiments (pp. 78–83). Laboratory bees offered equal parts of honey and the regular spray combination, consisting of lead arsenate 1.5 lbs. to 50 gal., lime-sulfur 1 : 40, and nicotine sulfate 1 : 1,000 were strongly repelled. Lead arsenate spray with honey was readily accepted by the bees, a one-frame nucleus fed on this mixture having lost approximately 50 per cent of its bees within 48 hours after feeding. Lead arsenate alone or combined with any of the other materials was very toxic to the bees. Any mixture containing nicotine sulfate was very repellent to bees and was fed on but sparingly, the repellent action persisting for at least 48 hours. In the orchard the period was somewhat shorter. Bees in a nucleus, placed in a greenhouse and offered bloom sprayed with the orchard combination, were at first repelled, but finally worked the flowers and suffered a very heavy mortality.

In orchard experiments, neither a late pink nor an early calyx spray, applied when there was considerable bloom on the trees, caused any serious mortality to colonies located in the sprayed orchards. This was due, in the one case, to the fact that the trees came into bloom very quickly after the late pink was applied, thus affording abundance of unsprayed blossoms; and in the other, to the fact that, since bees have a tendency to forage over a considerable area, the repellent action of the early calyx spray caused them to work bloom in nearby orchards.

In the tent experiments, there was no high mortality except immediately following the application of lead arsenate alone. This was in a measure due to unfavorable weather conditions, but also to uneven opening of the bloom.

The experiments indicate that, if the recommended combination of lead arsenate, lime sulfur, and nicotine sulfate is used, spraying should have no appreciable effect upon colonies not subject to any restrictions of flight. This is true even when some bloom is present, unless improperly timed spraying is carried out on a large scale.

On the microscopic examination of bees for acari, D. Morland (*Ann. Appl. Biol., 13 (1926), No. 4, pp. 502–505, figs. 2*).—This is a contribution from the Rothamsted Experimental Station on technique.

British ants, their life history and classification, H. St. J. K. Donisthorpe (*London: George Routledge & Sons, 1927, 2. ed., rev. and enl., pp. XV+436, pls. 18, figs. 93*).—This is a revised and enlarged edition of the work previously noted (E. S. R., 35, p. 262).

New species and new forms of Ichneumonidae parasitic upon the gipsy-moth parasite, Apanteles melanoscelus (Ratzeburg), R. A. Cushman (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 453–458*).—In this paper the author describes four new parasites which attack *A. melanoscelus* (Ratz.), an important parasite of the gypsy moth, namely, *Hemiteles apantelis*, *Gelis apantelis*, *G. inutilis*, and *G. nocuus*. Descriptions are also given of *G. bucculatricis* (Ashm.), and *G. urbanus* (Brues).

New species of chalcid flies parasitic on the gipsy-moth parasite, Apanteles melanoscelus (Ratzeburg), C. F. W. Muesebeck (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp. 331–333*).—The author describes three species of chalcid flies which he and S. M. Dohanian have found to be parasitic on the gypsy moth parasite, *A. melanoscelus* (Ratz.), namely, *Coelopisthia scutellata* n. sp., *Hypopteromalus inimicus* n. sp., and *Dimmockia pallipes* n. sp.

Four new chalcidoid parasites of the pine tip moth, Rhyacionia frustrana (Comstock), A. B. Gahan (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 545–548*).—Four chalcidoid parasites reared by R. A. Cushman and others of the U. S. D. A. Bureau of Entomology from the pine tip moth, *R. frustrana* (Comst.), are described as new. These include *Haltichella rhyacioniae* from Falls Church, Va., Nantucket Island, Mass., and Halsey, Nebr.; *Hyssopus rhyacioniae* from East Falls Church, Va.; *Elachertus pini* from Falls Church, Va.; and *Secodella subopaca* from Falls Church, Va.; and Bogalusa, La.

Two hymenopterous parasites of American jointworms, W. J. Phillips and F. W. Poos (*Jour. Agr. Research [U. S.], 34 (1927), No. 5, pp. 473–488, figs. 5*).—The authors here give an account of the life histories of two important parasites of species of Harmolita, namely, *Eupelminus saltator* Lind. and *Eridontomerus isosomatis* (Riley).

The life history and bionomics of a British phytophagous chalcidoid of the genus Harmolita (Isosoma), H. C. James (*Ann. Appl. Biol., 14 (1927), No. 1, pp. 132–149, figs. 12*).—This is an account given for the first time of the life history and habits of a British species of Harmolita, namely, *H. graminicola*, a gall former on couch grass.

Notes on the life-history of two oriental chalcidoid parasites of Chrysomphalus, H. Compere and H. S. Smith (*Calif. Univ. Pubs. Ent., 4 (1927), No. 4, pp. 63–73, figs. 13*).—The authors deal with *Comperiella bifasciata* How., of which the only known host in California successfully attacked is *Chrysomphalus aonidum* (Linn.), and with *Casca chinensis* How., which has been reared from *Chrysomphalus aurantii* (Mask.), *C. aonidum*, *Lepidosaphes beckii* (Newm.), and *Lepidosaphes* sp. (probably *tubulorum* Ferris).

Biological observations on the braconid parasite Macrocentrus abdominalis Fab. [trans. title], P. Voukassovitch (*Compt. Rend. Soc. Biol.* [*Paris*], *96* (*1927*), *No. 6, pp. 379–381*).—This is a report of observations conducted at the Central Institute of Hygiene at Belgrade.

The control of the black currant gall mite (Eriophyes ribis Westw., Nalepa.), A. M. Massee (*East Malling* [*Kent*] *Research Sta. Ann. Rpt., 13* (*1925*), *I, Gen., pp. 76–80, pls. 2*).—Experimental work at East Malling clearly shows that the application of a lime-sulfur spray to currant bushes in the spring, when the flower racemes appear but before the flowers open, is the most effective method of controlling this pest.

Modifications in the life cycle of Nosema bombycis Nägeli [trans. title] (*Ann. R. Scuola Super. Agr. Portici, 2. ser., 19* (*1924*), [*Art. 1*], *pp. 19, figs. 4*).—A report of studies of the causative organisms of pebrine of the silkworm.

ANIMAL PRODUCTION

The Bureau of Animal Industry: Its history, activities, and organization, F. W. Powell (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 41* (*1927*), *pp. XII+190*).—This monograph gives a comprehensive history of the bureau from its organization. The activities and organization are described in detail. Appended is an outline of its organization, classification of activities, publications, plant and equipment, laws, financial statement, and bibliography.

The scientific feeding of animals, O. Kellner, trans. by W. Goodwin (*London: Duckworth, 1926, 2. ed., rev., pp. XIII+328*).—This is the second edition of the book previously noted (E. S. R., 24, p. 769).

Sodium deficiency in a corn ration, H. G. Miller (*Jour. Biol. Chem., 70* (*1926*), *No. 3, pp. 759–762, fig. 1*).—Using corn, casein, and cod-liver oil as a basal ration, calcium chloride, sodium sulfate and carbonate, and calcium carbonate were added to determine the effect of sodium or the lack of it in a ration containing 80 per cent of corn.

When the ration contained no sodium salt normal growth was not supported. Five female rats receiving this ration failed to produce a single litter. Adding sodium carbonate to such a ration gave normal growth and satisfactory reproduction. Sodium supplied in the form of sulfate gave practically identical results with that in the form of carbonate. The ration supplemented with sodium sulfate and calcium carbonate was deficient in chlorine, but this lack had little effect on growth or reproduction. Rats receiving no sodium never consumed more than 10 gm. of the ration per day, and after 100 days of feeding their appetites declined. On the other diets the animals consumed as high as 15 gm. daily.

The author concludes that a ration containing 80 per cent of corn does not supply sufficient sodium for normal growth. It does, however, contain enough chlorine for growth, gestation, and lactation. Sodium may be supplied in the form of sulfate or carbonate with the same results.

Pig-feeding and cattle-feeding experiments, W. G. R. Paterson (*Highland and Agr. Soc. Scot. Trans., 5. ser., 36* (*1924*), *pp. 161–184; also West of Scot. Agr. Col. Bul. 102* (*1924*), *pp. 119–144*).—The results of two experiments are noted.

Pig-feeding experiments.—Four lots of 8 pigs each, averaging 36 lbs. in weight at the start of the experiment, were fed a basal ration of maize meal, fine thirds, barley meal, and fish meal (4:8:2:1). The supplements added in the various lots were lot 1 none, lot 2 lime, lot 3 calcium phosphate, and lot 4 calcium phosphate and cod-liver oil. The lime was fed in the form of $CaCO_3$ at

the rate of 0.5 oz. per pig per day, and the calcium phosphate was adjusted so that the pigs received a corresponding amount of calcium. Cod-liver oil was fed at the rate of 0.25 oz. per pig per day. During the first part of the experiment, which lasted 22 weeks, whey was fed at the rate of 0.5 gal. per pound of dry meal, but during the last 10 weeks it was not available. The grain mixture fed at the rate of 1.25 lb. per pig daily at the start was increased 0.25 lb. per week throughout the test. The pigs were killed at the close of the experiment, and information was obtained on carcass weights and quality of pork.

The results show that the addition of $CaCO_3$ or calcium phosphate to a ration containing 10 per cent of fish meal had no beneficial results. Adding lime under these conditions had an adverse effect upon the dressing percentage. Adding 0.25 oz. of cod-liver oil resulted in a greater live weight increase at a small additional cost and had no adverse effect upon the quality of the pork. In this work pigs over 196 lbs. in weight had a smaller dressing percentage than those weighing about 180 lbs.

Cattle-feeding experiments.—Three lots of 6 steers each were fed a basal ration of 60 lbs. of turnips, 8 lbs. of hay, and 8 lbs. of straw. To this basal ration was added in lot 1 3 lbs. each of decorticated cotton cake and crushed oats, lot 2 3 lbs. each of decorticated cotton cake and flaked maize (Uveco), and in lot 3 the same as lot 2 with the addition of 4 oz. of cod-liver oil per head daily. The amount of cake, crushed oats, and flaked maize was increased 0.25 lb. each fortnight. Four steers in each lot were fed 84 days and 2 steers 65 days.

Crushed oats were equal pound for pound to flaked maize in the production of gains and more efficient in producing a high dressing percentage. Feeding cod-liver oil, while increasing body weight, showed no advantage since the increased cost of feeding was approximately equal to the value of the increase.

Sheep breeding (*New Hampshire Sta. Bul. 227* (*1927*), *p. 7*).—A progress report of breeding work by E. G. Ritzman and C. B. Davenport is noted (E. S. R. 55, p. 863). No special tests were made regarding the milk yield of the ewes, but from the knowledge and observations of the shepherd they were graded as good, fair, and poor. These observations were further checked by the weight increase of the suckling lambs. Seventy per cent of all lambs born were twins. The average weight of the lambs at 3.5 months of age was over 60 lbs. per head.

Wool studies with Rambouillet sheep, F. S. Hultz (*Wyoming Sta. Bul. 154* (*1927*), *pp. 95–123*, *figs. 3*).—Forty-two head of Rambouillets were divided into four classes according to the quality of the fleeces, and the same sheep were again ranked in four classes on body conformation. Wool samples from 0.5 sq. in. of body surface were taken from the shoulder, thigh, and belly of each sheep. The laboratory treatment of the wool samples consisted of measuring the staple length, scouring the wool, measuring the fiber length, counting the number of crimps, measuring the diameter of the fibers, and determining the density in the order named.

The length of staple was inverse to the ranking of the judge. The average difference between the first and fourth class in length of staple was 0.3 in. The staple length averaged 66.54 per cent of the fiber length. In fineness the samples ranked shoulder, belly, and thigh, respectively. There was an average difference in diameter between the finest and the coarsest fibers of 0.00006 in. The fine fibers averaged 1.5 more crimps per inch than the coarse fibers. The higher ranking the fleece the greater was the density. Grade 1 yielded 74 per cent more fibers from a given area than grade 4. Uniformity of fleece was

correlated with fineness of fiber. Wide variations were obtained in the amount of scoured wool. There was a correlation between fleece rank and sheep rank in this study of 0.544±0.108.

It is concluded that a staple length of a 12 months' fleece at shoulder and thigh of 2.23 in. should be acceptable for show Rambouillet sheep. The range of diameter in fiber is quite important in determining the quality of the fleece. Density and the number of crimps per inch are also highly important in selecting good fleeces.

Hothouse lamb production, W. L. Henning and P. C. MacKenzie (*Pennsylvania Sta. Bul. 209 (1927), pp. 36, figs. 22*).—This is a progress report of work previously noted (E. S. R., 54, p. 363). Grade Merino and Dorset × Merino (first cross) ewes have been mated to Dorset and Southdown rams. Tables give in detail the records of weights of ewes and lambs. Records were also kept of the grades of fleeces produced by the ewes. Directions for feeding and marketing are given by the authors. The various types of ewes used in the experiment are illustrated, as also are the correct methods of killing, dressing, and shipping hothouse lambs.

Poultry keeping, A. Kinross (*West of Scot. Agr. Col. Bul. 100 (1922), pp. 89, figs. 22*).—This bulletin presents in a popular manner a few guiding principles and some practical information vital to successful poultry keeping. The selection of breeding stock; incubation; brooding; feeding of chicks, laying hens, and fattening birds; management; and housing are some of the topics taken up in the discussion.

The critical temperature of the chicken, H. H. Mitchell and W. T. Haines (*Jour. Agr. Research [U. S.], 34 (1927), No. 6, pp. 549–557, fig. 1*).—Twelve Rhode Island Red hens ranging in weight from 4 to 6 lbs. were used in these experiments at the Illinois Experiment Station, and 36 observations were made upon them. All the hens were fasted for at least from 41 to 48 hours and most as long as 72 hours before being used. A hen was placed in a chamber small enough to prevent movement and the chamber darkened, which also favored quietness. The chamber was heated to the temperature desired. Purified air was passed through the chamber at the rate of 3 liters per minute. The outgoing air passed through caustic soda and sulfuric acid bottles, and the carbon dioxide production was measured by determining the increase in weight of these bottles. The amount of carbon dioxide produced was measured in milligrams per minute at temperatures advancing 5° at a time from 45 to 85° F.

By elimination it was found that these hens during fast in an atmosphere of low humidity and with winter feathering had a critical temperature of 62°. Individuals varied in their reaction to environmental temperatures. By applying Newton's law of cooling bodies to these results, it was estimated that a drop of 1° in temperature required an increase over normal basal heat production (115 calories per day) of 2.6 calories per day. A hen on a ration composed mostly of corn and in amounts sufficient to support production of one egg per day could stand outdoor temperatures of 15° before requiring additional feed to keep the body warm. This prediction is true if the humidity is not high nor the animal exposed to sharp winds.

Rearing chickens, L. M. Hurd and L. E. Weaver (*N. Y. Agr. Col. (Cornell) Ext. Bul. 153 (1927), pp. 29, figs. 24*).—This is a popular presentation on the hatching, brooding, feeding, housing, and management of chicks.

Fat-soluble A requirements for growing chicks, S. M. Hauge, C. W. Carrick, and R. W. Prange (*Poultry Sci., 6 (1927), No. 3, pp. 135–140, figs. 4*).—Continuing the study on the vitamin requirements of growing chicks (E. S. R., 58, p. 166), a test was conducted to determine the minimum amount of fat-

soluble A required. Three lots of 20 Single Comb White Leghorn chicks were placed on a ration deficient in vitamin A. To this ration was added in lot 2 25 per cent and in lot 3 50 per cent of yellow corn. Up to 8 weeks of age all chicks were irradiated daily with ultra-violet light. After this time they received direct sunlight.

During the first 3 weeks all lots made similar gains in weight. After that the lots receiving yellow corn showed decidedly better gains, and both of these lots grew at about the same rate. Up to 8 weeks only 2 chicks died in the vitamin A deficient lot, and their loss was not attributed to ration deficiency, but during the eighth week chicks in this lot showed signs of deficiencies and gradually died until at the end of the nineteenth week only 1 remained. Most of these chicks showed diseased eyes before death. Others showed unsteadiness in movements but died before the eyes were infected.

Five chicks died during the first 10 days in the lot receiving 25 per cent of yellow corn from causes other than nutritional. None died in the lot receiving 50 per cent of yellow corn during the first 9 weeks. No symptoms of ophthalmia appeared in either of these lots.

From the results secured it appeared that 25 per cent of yellow corn was sufficient to meet the needs of growing chicks up to 10 weeks of age. Because of the heavier weight of the lot receiving 50 per cent of yellow corn at laying age, it was deemed advisable to use that amount after 10 weeks. Chicks fed a ration deficient in vitamin A begin to show the results of this deficiency at about 4 weeks of age.

The effects of freezing the combs of breeding males, L. F. Payne and C. Ingram (*Poultry Sci., 6 (1927), No. 3, pp. 99–107, figs. 3*).—In experiments at the Kansas Experiment Station eight lots of 10 pullets and 1 vigorous cockerel each, fed various rations, were used to test the effect of freezing of the combs of the males upon the fertility and hatchability of the eggs. Four cockerels were kept indoors, while the remainder were left in the open on a night when the thermometer registered 6° below zero, their combs and wattles being severely frozen. In one case the feet also froze, and the cockerel was so impaired physically that the lot had to be discarded. All cockerels were placed in the pens with the pullets the morning following the freezing process, and 3 days later the eggs were collected and incubated. Records were kept on the fertility and hatchability of each day's eggs for 4 weeks in the case of the frozen and 2 weeks in the case of the nonfrozen lots. The frozen tissue dropped off in from 4 to 5 weeks. Freezing reduced the fertility and hatchability below normal for only 11 days, which is a much shorter period than is commonly supposed.

The relation of rate of maturity to egg production, M. W. Buster (*California Sta. Bul. 424 (1927), pp. 21, figs. 6*).—The results reported in this publication are more detailed accounts of the work previously noted (E. S. R., 54, p. 766). In checking the results it was found that there was little difference in the percentage of Nos. 1, 2, and 3 eggs produced by the early, medium, and late maturing groups. The early maturing birds laid a larger number of eggs of all sizes than the other groups. One test flock composed of 1,070 early maturing and late maturing pullets was culled at approximately 16 months of age, 26 per cent being culled as unprofitable. Only 18 per cent of the early maturing birds were in this class, while 50 per cent of the late maturing were discarded.

The weight of eggs in connection with the time of day when they are laid, H. Atwood (*Poultry Sci., 6 (1927), No. 3, pp. 108, 109*).—Further study on work previously noted (E. S. R., 55, p. 568) has shown that the first egg of

a series of successive layings is generally the heaviest. Furthermore the first egg of each cycle is usually laid relatively early in the day.

A study was made of the eggs laid by 186 Single Comb White Leghorns in their first laying season for a period of 30 days, during which 4,864 eggs were laid. Eggs were gathered at 9, 10, and 11 a. m., 12 m., and 2 and 5 p. m. Weights were taken of the individual eggs the following morning after laying. The eggs gathered at 9 a. m. had a mean weight of 55.22±0.08 gm. There was a fairly large drop from the first to the second period and a significant decrease from the second to the third period. The total decrease during the day was 1.37±0.12 gm., or approximately 2.5 per cent. There was no significant difference in the standard deviation in weight of eggs laid during the different periods.

The incubation of hen's eggs, F. D. Brooks (*Purdue Agr. Ext. Bul. 101, 3. rev. ed. (1927), pp. 12, figs. 7*).—This is the third revision of the bulletin previously noted (E. S. R., 48, p. 477).

Ducks (*London: Feathered World, [1926], pp. 1–139, figs. 86*).—A treatise on general production, discussing hatching, brooding, feeding, fattening, killing, marketing, housing, diseases, and selection of breeding stock. The good and bad points and the description and history of many breeds of ducks are included. The illustrations show the male and female of the various breeds.

DAIRY FARMING—DAIRYING

The relation of sunlight to the growth and development of calves, T. W. Gullickson and C. H. Eckles (*Jour. Dairy Sci., 10 (1927), No. 2, pp. 87–94, figs. 2*).—Four heifer calves were placed on an experiment at from 3 to 7 days of age. Two were confined in a completely dark well-ventilated box stall and allowed in the open only at night. The other 2 were allowed to run out of doors during the day and confined only at night. The ration for all animals was identical, the grain portion consisting of corn meal, corn gluten feed, wheat bran, and linseed oil meal 3:1:1:1, and timothy hay of fair to poor quality forming the roughage. The animals were weighed every 10 days and the height at the top of the withers measured every 30 days during the 2-year period.

The animals in both lots continued normal in all outward respects during the test. All heifers came in heat when less than a year of age. The 2 in the "sunlight" group were accidentally bred at the first heat period. One dropped a normal full-time calf, and the other a small, slightly deformed calf, with both eyes present, but blind. This condition was not thought to be due to the ration. One heifer in the "no sunlight" group was bred at about 16 months of age and dropped a normal calf. The other heifer of this group was found to have malformed reproductive organs, which prevented conception but did not hinder oestrum.

From these data it is concluded that the absence of sunlight was without effect upon calves kept in darkness from the age of 1 week to 2 years. Normal reproduction also occurred.

A physiological study of dairy cows (*New Hampshire Sta. Bul. 227 (1927), pp. 8, 9*).—A brief review of data secured by J. M. Fuller is noted. The respiration rate of cows under normal herd conditions varied from 12 to 58 per minute and the pulse rate from 52 to 88 per minute. Continuous 3-day observations of 38 cows showed that from 34.8 to 63.35 per cent of their time was pent in standing up. The results of 3 days' measuring of water consumed showed a minimum consumption by any one cow through a 24-hour period of 18 lbs. and a maximum of about 283.75 lbs. The maximum number of urinations and defecations ran as high as 20 per day with some cows.

Judging dairy cattle, A. B. Nystrom and C. H. Schopmeyer (*U. S. Dept. Agr. Misc. Circ. 99 (1927), pp. 30, figs. 21*).—The authors set forth in a practical manner the objects and principles of judging dairy cattle. The major and minor points to be observed, the score card, comparative judging, and the judging of bulls and heifers are carefully considered. Score cards for the various breeds of dairy cattle and also a general dairy score card are appended. Models for cards for placings and reasons and various methods of grading are suggested. Pictures illustrate the good and bad points of dairy cattle and the ideal or typical type for the major breeds.

The popularity of the Jersey in America, F. R. Edwards (*Jersey Bul. and Dairy World, 44 (1925), No. 39, pp. 1705, 1750, 1752, 1756, 1758, 1760, fig. 1*).—From data obtained from the 1920 census, the author has prepared a map showing the location of Jersey cattle in relation to all purebred dairy cattle. When the United States is divided into five latitudinal zones there is a marked gradation from zone 5, the most southern, to zone 1, the most northern. The percentage of purebred Jerseys to other purebred dairy cattle in zone 5 is 76.9, and in the remaining zones 50.5, 42.4, 26, and 12.4 per cent, respectively. The exception to this gradual increase from north to south is the northwest, especially in Oregon, where Jersey cattle make up over 60 per cent of the purebred dairy cattle.

The author believes that the principal cause of this distribution is that the Jersey, being primarily a "butter cow," has concentrated in sections where the rural population outnumbers the population of the cities. In other sections it may be due to early popularity or to the influence of the breed "boosters."

Milk yield in relation to recurrence of conception, W. L. Gaines (*Jour. Dairy Sci., 10 (1927), No. 2, pp. 117–125, figs. 3*).—A study of 4,893 Guernsey records indicated that the mean service period was 174 days. This, from the author's viewpoint, is extremely long from the standpoint of economical production, and represents an attempt on the part of the breeders to obtain a maximum 365-day record.

The first full calendar month milk yield and the service period of 4,671 records show a correlation coefficient of 0.039 ± 0.01. There is no evidence from these results that a high rate of milk yield interferes with the recurrence of conception.

Persistency of fat secretion during the lactation period as affected by age, C. W. Turner (*Jour. Dairy Sci., 10 (1927), No. 2, pp. 95–105, fig. 1*).—In continuing these studies on the factors influencing lactation (E. S. R., 56, p. 170), the records of the Advanced Register of Guernsey cattle were used to determine the effect of age on the persistency of fat secretion. Only nonpregnant cows were used for the study. The animals were divided according to age, as 2 to 3 years and so on up to 8 to 9 years. The data showed that the average persistency of fat secretion declines rapidly between the second and third lactation periods as compared to the first and less rapidly as maturity is reached.

A summary is made of the literature indicating the nature of the stimulation of the mammary gland growth and secretion. The theory is advanced that the normal or hereditary rate of decline of milk secretion during the early lactation periods is retarded, due to further division of cells which become functional through the stimulation of the "follicular" hormone and to the increased activity of the cells due to an increased blood supply and perfection of the functioning of these cells.

Fifteenth annual report of the International Association of Dairy and Milk Inspectors, compiled by I. C. Weld (*Internatl. Assoc. Dairy and Milk*

Insp. Ann. Rpt., 15 (1926), pp. 334, figs. 6).—The usual report of the annual meeting (E. S. R., 55, p. 470), held at Philadelphia, Pa., October 25–27, 1926, includes the following papers:

Presidential Address (pp. 40–42), by G. C. Supplee; Ice Cream as a Food for Children (pp. 43–50), by S. A. Cohen; Report of Committee on Sanitary Control of Ice Cream (pp. 51, 52), by R. E. Irwin; The Dairy Inspector's Ideal (pp. 53–57), by W. G. Hollingworth; The Future of Dried Milk (pp. 58–64), by A. F. Stevenson; How Municipalities May Cooperate in Milk Control (pp. 65–74), by G. W. Grim; Safe Milk for Small Communities (pp. 75–88), by I. V. Hiscock; Industrial Milk Service (pp. 89–103), by M. O. Maughan; Report of Committee on Score Cards and the Score Card System of Rating Dairies and Dairy Products (pp. 104–113), by T. J. Strauch; Report of Committee on Methods of Obtaining a Satisfactory Quality of Raw Milk for Pasteurization (pp. 114, 115), by E. Moore; Certified Milk (pp. 116–125), by F. D. Holford; Some Aspects of Milk Inspection Publicity (pp. 126–132), by E. B. Johnson; What the Pennsylvania Association of Dairy and Milk Inspectors is Doing (pp. 133–136), by W. W. White; Milk Grading in Richmond, Virginia (pp. 137–141), by T. J. Strauch; Report of Committee on Bovine Diseases—Their Relation to the Milk Supply and to the Public Health (pp. 142–146), by C. D. Pearce; Disease Prevention—Modern Aim (pp. 147–154), by J. F. Johnston; The Suppression of Tuberculosis of Live-Stock (pp. 155–171), by J. A. Kiernan; Report of Committee on Communicable Diseases Affecting Man—Their Relation to the Milk Supply and to the Public Health (pp. 172–182), by J. L. Rice; Report of Committee on Milk Ordinances (pp. 183–185), by W. B. Palmer; Outbreaks of Milk-Borne Diseases (pp. 186–192), by C. Armstrong; The Supervision of Milk Pasteurizing Plants in New York State (pp. 193–199), by J. F. Miller; A Comparison of the Fat-Readings Obtained in the 8 Per Cent and 10 Per Cent Babcock Milk Bottles, Using a Cold Centrifuge (pp. 200–206), by F. J. Amrhein and J. P. Serpa; Report of Committee on Remade Milk (p. 207), and Media Composition and Bacteria Counts of Milk (pp. 208–221), both by J. H. Shrader; Report of Committee on Food Value of Milk and Milk Products (pp. 222–237), by I. V. Hiscock; Report of Committee on Methods of Bacterial Analysis of Milk and Milk Products (pp. 238–243), by G. E. Bolling; State and Municipal Milk Regulations (pp. 244–252), by R. E. Irwin; Report of Committee on Transportation of Milk and Milk Products (pp. 253–270), by J. J. Frey; Tuberculin-Tested Milk and the 150-Mile Zone (pp. 271–274), by R. F. Leslie; The Tuberculin Test and Pasteurization (pp. 275–277), by C. S. Stirrett; Report of Committee on Dairy and Milk Plant Methods (pp. 278–290), by H. A. Harding; The Philadelphia Inter-State Dairy Council (pp. 291–308), by R. W. Balderston; Standards for Sediment Tests (pp. 309–313) and Results from Bonus on Sediment and Reductase Tests (pp. 314–322), both by H. A. Harding; Some Dangers of Raw Milk (pp. 323–326), by F. C. Ruth; and The Colorimetric Determination of the Hydrogen Ion Concentration of Milk (pp. 327–334), by T. J. McInerney and P. F. Sharp.

Proceedings of the [seventeenth to twentieth] conferences of the American Association of Medical Milk Commissions in conjunction with the Certified Milk Producers' Association of America (*Amer. Assoc. Med. Milk Comms. Proc., 17–18 (1923–1924), pp. IV+[2]+258, figs. 15; 19–20 (1925–1926), pp. IV+[2]+340, figs. 12*).—These are compilations of the proceedings of the seventeenth and eighteenth conferences, held in 1923 and 1924, and of the nineteenth and twentieth coferences, held in 1925 and 1926 (E. S. R., 49, p. 175).

Effect of mineral deficiency on the yield and composition of cow's milk, R. B. Becker, C. H. Eckles, and L. S. Palmer (*Jour. Dairy Sci., 10 (1927), No.*

2, pp. 169–175).—Four cows suffering from osteomalacia were used in this study. Their basal ration consisted of prairie hay and oats from sections where this trouble commonly occurs. They had free access to common salt and water and in fair weather were allowed to remain outdoors. Five-day composite milk samples were collected and preserved with formaldehyde for mineral analysis. After the first series of samples were taken, the basal ration was supplemented with inorganic mineral supplements and milk samples again taken. Calcium carbonate was the first supplement used. For 2 cows this was later replaced with calcium phosphate. The remaining cows on calcium carbonate declined in vigor and condition. When the ration was later supplemented with monobasic sodium phosphate or tricalcium phosphate, complete recovery was effected as far as visible symptoms were concerned.

Twenty-four samples of milk were analyzed for total solids, total ash, phosphorus, and calcium, and also fat. A check sample was taken from the mixed milk of a herd producing about 1,000 lbs. of milk daily and was analyzed in the same manner. A comparison of these analyses showed no marked differences. The results of this test showed that even under conditions of severe osteomalacia resulting from a continued shortage of phosphorus the calcium and phosphorus content of the milk remains normal in amount and proportion.

The formation of acid in milk by heating, E. O. WHITTIER and A. G. BENTON (*Jour. Dairy Sci., 10 (1927), No. 2, pp. 126–138, figs. 7*).—Milk in sealed containers was heated above the boiling point. Acid was formed during this heating at a rate which is a direct function of the time and temperature of the heating and of lactose concentration. There was a temporary arrest of H-ion concentration during the early stages of coagulation, probably due to a powerful buffer action which lasts but a short time. There was no apparent relationship between the coagulation of casein and acid formation. Similar results were produced by heating a 5 per cent lactose solution, buffered with the same amount of phosphate and citrate and adjusted to the same initial H-ion concentration as existed in the milk.

Increased lactose concentration caused an increase in the amount of acid formed during heating, but additional sucrose had no apparent effect. The loss of lactose in the heated milk more than accounted for the acid produced. It is evident from these data that lactose is the principal source of acid produced by heating milk.

The deleterious effect of freezing on several of the physical properties of milk, W. H. E. REID (*Missouri Sta. Research Bul. 100 (1927), pp. 14, figs. 8*).—The data reported in this publication are a more detailed report of work previously noted (E. S. R., 54, p. 772).

Gelatinated buttermilk, A. D. BURKE ET AL. (*Milk Dealer, 16 (1927), No. 7, pp. 25, 116, 118, 120*).—In this test at the Oklahoma Experiment Station, 4 grades of gelatin were used at the rate of 0.3 per cent, which was thought to be sufficient. Half-gallon quantities of fresh skim milk were used in each lot of every series. The buttermilk was made under ordinary methods, employing a culturing temperature of from 68 to 72° F. Four different cultures were used, and each was tested with the four grades of gelatin.

The gelatin was added by various methods to eliminate any criticism on this point. To lot 1 of each series granulated gelatin was added, the milk heated to 190° while continually agitated, cooled to 68°, and cultured. In the second lot of each series the gelatin was added after the milk had been heated and cooled to 135°, the gelatin being dissolved in a portion of milk heated to not over 140°, the mix cooled to 68°, and cultured. To lot 3 of each series the gelatin was added after the buttermilk had been prepared and

broken up. The gelatin in this case was dissolved in 0.25 pint of water at 140°. Series 4 contained no gelatin.

In six cases titration showed samples containing gelatin to have a higher acidity and in six cases a lower acitity than the check lots. Variations in acidity occurred between the different series, due probably to the use of different cultures. There was no direct relation between acidity and the use of gelatin. Viscosity was determined by pouring 2 cc. of buttermilk on plate glass set at an angle of 23° 40′ and measuring the time required to run 12 in. Great variation existed between different lots in the same series. Holding the buttermilk for 24 hours increased the viscosity of all lots including the check, but the viscosity of the lots containing gelatin was greater than the controls. Samples containing gelatin broke up easier, and the curd appeared softer than those containing no gelatin. It was found that good quality buttermilk that did not whey off could be prepared without the use of gelatin, but that gelatin did prevent wheying off in buttermilk which without it might show this defect. The addition of 0.3 per cent gelatin gave the buttermilk a slight off flavor, and this was the more noticeable the longer the samples were held.

The manufacture of cheddar cheese from milk pasteurized by the holder method, W. V. Price (*New York Cornell Sta. Mem. 105 (1927), pp. 36, fig. 1*).—In order to eliminate difficulties experienced in making Cheddar cheese from raw milk of poor quality, experiments were undertaken to determine the advisability of pasteurizing the milk. Preliminary work indicated that milk pasteurized at high temperatures by the flash method coagulated slowly and formed a weak-bodied curd. In these tests, therefore, the holder method of pasteurizing was used. The milk to be used for cheese was divided into two lots. One lot was pasteurized and the other used raw. Care was taken to make the handling of both lots as uniform as possible, and each vat was made into the best cheese possible. The cheeses were scored at intervals during the ripening period by competent judges.

It was found in tests with 46 pairs of cheeses that Cheddar cheese can be successfully made from milk pasteurized at 145° F. for 30 minutes. Such cheese was of better average quality and retained more uniform quality under storage conditions than raw-milk cheese. Pasteurization was more advantageous when the milk was of poor quality, but in all cases pasteurizing tended to increase the yield of cheese, due to the retention of more fat, moisture, and milk solids-not-fat in the curd. In trials on a commercial basis it was found that pasteurizing the milk for cheese making was practical, economical, and profitable.

A new method of manufacturing cream cheese of the Neufchatel type, A. C. Dahlberg (*Jour. Dairy Sci., 10 (1927), No. 2, pp. 106–116*).—Under the new method sweet cream of good flavor containing from 40 to 45 per cent of fat is used as the basis for the cheese. To this is added 5 per cent of soluble dry skim milk and either 1 per cent of high-grade powdered pure food gelatin or 0.5 per cent of powdered agar. The mixture is then pasteurized at 145° F. for 30 minutes if gelatin is used, and at from 180 to 185° for 10 minutes if agar is used. After pasteurization the mixture is cooled at 110° and 0.75 per cent of common salt and 0.5 to 1 per cent of good commercial starter are added, the mixture is passed through a coarse strainer, and it is homogenized with pressure at 3,500 to 4,000 lbs. per square inch. After being homogenized the mix is cooled to 70° and held at that temperature until a mild acid flavor develops. It is then considered cream cheese, and may be stored at 32 to 40° for from 2 to 5 weeks without deterioration.

The author also describes the advantages and disadvantages of this new method and the influence of varying the constituents of the mixture.

How to make Italian cheese, H. W. Vetterlein (*Milk Dealer, 16 (1927), No. 7, p. 32*).—The author outlines a method of utilizing skim milk that may prove profitable. Milk is separated at 90° F. and 300 gal. of the sweet skim milk run into an ordinary 350-gal. cheese vat. Four oz. of rennet are diluted in a quart of water, heated at 90°, and added to the skim. The mix coagulates in about 30 minutes, and when firm is cut into 0.5 in. cubes and stirred until the curd settles to the bottom. The whey is then pumped off into a copper kettle, and 15 gal. of starter made from sour cottage cheese and vinegar is added. The whey is heated to 140° and 50 gal. of skim milk added. The temperature is raised to 160°, and 12 qt. of 40 per cent cream and 5 lbs. of cheese salt are added. Heating is continued at 190° until the cheese rises to the top, when it is skimmed off, placed in perforated molds holding 5 lbs., covered with parchment paper, and allowed to drain overnight. This cheese is then ready for use, but should be kept cold as it spoils easily.

The curd that is left in the cheese vat after the whey is pumped out is piled up and, when firm, cut with a cheese knife into slabs 10 by 12 by 6 in. thick, and is known as Italian slab cheese. The slabs are ground up fine, mixed with cream, and molded into pear-shaped forms weighing 1 lb. each. The molds are hung and allowed to dry before being sold.

A study of some important factors affecting viscosity of ice cream mix (*New Hampshire Sta. Bul. 227 (1927), p. 9*).—Experiments by H. F. DePew on the influence of certain factors on the viscosity of ice cream mix showed that the following increased viscosity: (1) Homogenization, in proportion to the pressure; (2) gelatin; (3) pasteurization at 150° F. for 20 minutes and homogenization at that temperature instead of cooling to 110° and homogenizing; (4) aging at temperatures between 32 and 40°; and (5) sweetened condensed milk rather than skim milk powder when substituted for condensed skim milk. Longer freezing periods were required to produce the same overrun when a very viscous mix was frozen as compared with a less viscous mix.

Eliminating wide variation in density, G. D. Turnbow and K. W. Nielson (*Ice Cream Rev., 10 (1927), No. 9, pp. 98, 100, 102, 104, 106*).—In continuing these studies on ice cream density at the California Experiment Station (E. S. R., 56, p. 873), experiments were conducted in which the speeds of the scraper and beater of the freezer were taken into consideration. The freezer used was so constructd that the scraper and beater could be operated independently or discontinued during the process. The mixes used contained approximately 11 per cent fat and 36.5 per cent total solids. Results obtained with over 1,000 gal. of ice cream are reported.

The experiments show that by turning off the beater during the unloading period the variation in the density of the ice cream for consecutively drawn cans can be reduced to a minimum. The beater plays little or no part in developing yield during the freezing process. When the speed of the scraper was 140 r. p. m. or less there was little variation in the overrun, but at 211 r. p. m. there was a very noticeable decrease in density. Increasing the speed of the beater reduced the time required to freeze and whip the mix, but the beater was not a very important factor. The higher the speed of the scraper the less variation there was in the weight of the finished product and the shorter the time required to draw the ice cream. The principal function of the beater appears to be in transferring heat, dividing the air cells, and producing a smoother product. Increasing the speed of the beater and scraper produced an ice cream of better texture, but there was no noticeable difference in the melting resistance of samples made at different speeds.

Gelatine and mix viscosity, H. H. Sommer (*Ice Cream Rev., 10 (1927), No. 9, pp. 82, 84, 86*).—In studying the relation of gelatin to the viscosity of the finished product at the Wisconsin Experiment Station, a mix was divided into three parts and aged in different ways. One part was aged quietly, another was agitated for several minutes at intervals of from 2 to 3 hours, and the third part was stirred constantly. Examination of the finished product showed no differences in the body or texture. The author concludes that breaking up the gel structure that is formed during quiet aging has no detrimental effects.

Two fallacies in regard to the testing of gelatin to determine its value are pointed out. The first of these is that while the acidity of gelatin affects its jelly strength it may also have a different effect at the acidity point of the ice cream mix. The second fallacy is that the simple test made to determine the purity of the gelatin does not take into consideration the acidity which will prevent the growth of bacteria.

Powdered buttermilk in ice cream, W. B. Combs (*Ice Cream Rev., 10 (1927), No. 9, pp. 78, 80*).—A comparison of four different ice cream mixes was made at the Minnesota Experiment Station to determine the quality of product when sweet buttermilk powder was used. This powder, a new product, was found to contain from 95 to 98 per cent of total solids, 3.5 to 6.5 per cent of butterfat, and 1.2 to 5 per cent of moisture. When made by the drum process it is 67.5 per cent soluble, and 90 per cent soluble when made by the spray method.

All mixes were prepared to contain 38 per cent total solids, 12 per cent fat, 15 per cent sugar, 10.5 per cent serum solids, and 0.5 per cent gelatin. Mix 1 was made from cream containing 35 per cent fat, sweetened condensed skim milk, and skim milk; mix 2 was prepared from cream, skim milk powder, and water; mix 3 from cream, sweet buttermilk powder, and water; and mix 4 from butter oil, sweet buttermilk powder, and water. All mixes were pasteurized at 145 to 150° F. for 30 minutes, homogenized at 2,000 lbs. pressure, and cooled to 40°. After cooling they were aged for 24 hours, frozen, and hardened at 0° for 48 hours.

Of a group of 60 students, 41.6 per cent preferred the check lot as to taste and texture, and 30 per cent the fourth lot. Only 6 of the entire group placed lot 4 as their fourth preference. An ice cream of good quality was made by the use of sweet buttermilk powder to build up the serum solids in the mix. Such ice cream possesses more color due to the characteristic color of the powder. The keeping qualities of sweet buttermilk powder exceed that of whole milk powder.

VETERINARY MEDICINE

Elements of pathology, A. G. Ellis (*Philadelphia: P. Blakiston's Son & Co., 1926, pp. X+544, pl. 1, figs. 94*).—The first part of this work deals with the principles of pathology (pp. 1–276) and the second part with post-mortem technique, pathological anatomy, and histology (pp. 277–534).

Handbook of comparative anatomy of domestic animals, W. Ellenberger and H. Baum (*Handbuch der Vergleichenden Anatomie der Haustiere. Berlin: Julius Springer, 1926, 16. ed., pp. XV+1072, figs. 1373*).—The subject is here presented under the headings of introduction (pp 1–16), bones and ligaments (pp. 17–206), muscles (pp. 207–333), viscera (pp. 334–597), blood vessels (pp. 598–765), nerves (pp. 766–909), sense organs (pp. 910–962), integument (pp. 963–992), and anatomy of the domestic fowl (pp. 993–1031). A bibliography is included (pp. 1032–1046)

Report of the proceedings of the thirtieth annual meeting of the United States Live Stock Sanitary Association (*U. S. Livestock Sanit. Assoc. Rpt., 30 (1926), pp. 272, figs. 20*).—Among the papers and reports presented at the annual meeting of this association (E. S. R., 57, p. 179) are the following: The address of the president, by J. R. Mohler (pp. 13–33); The Mineral Metabolism of Dairy Cattle and Swine, by E. B. Forbes (pp. 35–49); Report of Committee on Nutritional Diseases, by A. F. Schalk et al. (pp. 49–60); The Effect of Inadequate Federal Regulations in the Interstate Movement of Cattle from the Quarantine Area, by J. H. Bux (pp. 60–64); The Scope of State Cooperation Necessary for Effective Tick Eradication, by H. Robbins (pp. 65–68); The Texas Cattlemen's Viewpoint of and Interest in Tick Eradication, by E. B. Spiller (pp. 68–73); Report of Committee on Tick Eradication, by P. F. Bahnsen et al. (pp. 74, 75); Intradermic Tuberculin Reactions, by W. J. Fretz (pp. 77–88); Avian Tuberculosis Infection in Mammals Other than Swine, by L. Van Es (pp. 89–94); The Relation of Tuberculosis in Lower Animals to Tuberculosis in Man, by W. C. White (pp. 94–100); Tuberculosis of Human Type in Garbage-Fed Hogs, by W. J. Butler and H. Marsh (pp. 100–104); Some Thoughts on Tuberculosis, by E. C. Schroeder (pp. 104–113); Tuberculosis, Its Extent and Eradication, by J. A. Kiernan (pp. 122–138); The Development of Bovine Tuberculosis Control Measures in Canada, by G. Hilton (pp. 139–146); The Reaccrediting of Modified Accredited Areas, by W. Moore (pp. 147, 148); Protecting Tuberculin-Tested Areas, by S. E. Bruner (pp. 148–153); The Relation of the Milk Dealer to the Problem of Tuberculosis Eradication, by F. D. Walmsley (pp. 153–158); Financing and Completing the Project of Eradicating Tuberculosis in the United States, by H. R. Smith (pp. 158–164); Evidence That Nutritional Deficiencies Are Factors in the Problem of Abortion and Sterility in Dairy Cattle, by E. B. Meigs (pp. 169–176); The Value and Need of Uniform Methods for Conducting Tests for Bovine Infectious Abortion, with an Account of Experimental Work, by C. P. Fitch (pp. 180–188); Report of Committee on Bovine Infectious Abortion, by G. H. Hart et al. (pp. 188–193); Report of the Hog Cholera Situation, by T. P. White (pp. 193–199); Post-vaccination Complications, by R. R. Birch (pp. 199–206); Principles Which Should Govern the Commercial Production of Anti-hog Cholera Serum and Virus, by A. Eichhorn (pp. 206–212); Report of Committee on Swine Diseases, by C. H. Stange et al. (pp. 214–220); Avian Tuberculosis Eradication from the Standpoint of Public Disease Control, by C. H. Hays (pp. 221–230); The Control of Bacillary White Diarrhea, by R. A. Craig (pp. 230–234); Report of Committee on Poultry Diseases, by L. Van Es et al. (pp. 234–239); Summary of Observations of the Commission to Study Foot-and-Month Disease, by P. K. Olitsky (pp. 240–248); The Parasite Problems of the Live Stock Industry in the United States and in Central America, by M. C. Hall (pp. 249–260); Report of Committee on Parasitic Diseases, by M. C. Hall et al. (pp. 260, 261); Report of Committee on Meat and Milk Hygiene, by J. P. Iverson et al. (pp. 261–264); Report of Committee on Unification of Laws and Regulations, by W. Moore et al. (pp. 265, 266); Report of Committee on Miscellaneous Transmissible Diseases, by A. W. Miller et al. (pp. 266–269); and Report of Committee on Tuberculosis, by M. Jacob et al. (p. 270).

Annual report of the veterinary laboratory, Nishigahara, Tokyo, Japan, for the year 1925 (*Vet. Lab., Nishigahara, Tokyo, Ann. Rpt. 1925, pp. [3]+134, pls. 2*).—Included in this report are the following papers: On the Anti-rabic Vaccination in the Dog, by S. Kondo (pp. 1–4); On the Disinfection of Animal-hairs, by A. Iizuka (pp. 5–12); Investigation on a Diarrhea in Young Chicks in Japan, by N. Nakamura (pp. 13–20) (E. S. R., 56, p. 670); Experimental Studies on Avian Diphtheria, by N. Nakamura (pp. 21–30); Studies on Bovine Influenza, by H. Futamura (pp. 31–39); A Study in Active

Immunization Against Fowl Cholera, by K. Sakamoto (pp. 41–44); On a Soluble Toxin Produced by *Bacillus chauvoei*, by K. Okuda (pp. 45, 46); On the Rabicidal Property of Anti-rabies Serum, by S. Kondo (pp. 47–59); On the Prophylactic Value of Iodized Tetanus Toxin, by K. Okuda (pp. 61, 62); Studies on Rinderpest in Deer (*Cervus sika*) and Changes in the Blood of Infected Animals, by S. Ono and S. Kondo (pp. 63–67); On the Complement Fixation Test in Strangles, by H. Oguni (pp. 69, 70); Studies on Bovine Influenza (Second Report), by H. Futamura (pp. 70–72); On the Changes in the Blood and the Distribution of the Virus in Rabid Animals, by M. Ohashi (pp. 73–80); Bacteriological Study of Canine Distemper, by S. Kondo (pp. 80–82); A Study of Antianaphylaxis, by A. Iizuka (pp. 83–89); On the Disinfection of Animal Bones, by A. Iizuka and T. Watanuki (pp. 90–94); On the Iodized Swine Erysipelas Vaccine, by S. Fujimura (pp. 94–96); Comparative Studies on the Methods for Preparing Serum, by H. Oguni (pp. 96, 97); Contributions to the Experimental Study on the Preparation of the Blackleg Precipitin Serum, by Y. Kawamura (pp. 98–102); On the Serological Differentiation of *B. abortus* and *B. melitensis*, by H. Futamura (pp. 102–104); Notes upon a Certain Anaerobe Isolated from Whale Muscle (First Report), by Y. Kawamura, H. Nagao, and Y. Fukuyama (pp. 104–106) (E. S. R., 55, p. 876); The Technique of Ovariotomy in the Dog [trans. title], by S. Matsuba (pp. 107–119); New Cases of Contagious Pustulous Dermatitis of Swine, by H. Futamura (pp. 121–123) (E. S. R., 56, p. 175); Contribution to the Biological and Serological Study of *B. abortus equi*, by S. Fujimura, T. Toyoshima, and T. Suenaga (pp. 125–129) (E. S. R., 56, p. 175); A Coryne-Bacillus as a Cause of Abscess in the Feet of Hens, by Y. Kawamura (pp. 131–133) (E. S. R., 56, p. 280); On the Specificity of *Streptococcus equi*, by H. Oguni and T. Sawada (p. 134); and Present Status of Investigations on Osteomalacia of Horses in Germany, by U. Tanaka (p. 134).

Diseases of animals in relation to man, T. W. M. CAMERON (*London: Faber & Gwyer, 1926, pp. 222, figs. 13*).—A brief popular handbook on diseases of animals transmissible to man.

Host-parasite specificity in the coccidia of mammals, J. M. ANDREWS (*Jour. Parasitol., 13 (1927), No. 3, pp. 183–194*).—The author's studies indicate that *Isospora felis* and *I. rivolta*, found in the cat and dog, are infective to both animals, though the course of the infection varies in each. With this exception, the coccidia of mammals seem to be strictly host specific parasites, as judged by cross-infectivity experiments on cats, dogs, rabbits, skunks, opossums, pigs, and prairie dogs. The studies show that excystation of the oocyst is facilitated by the digestive processes of the natural host, but that in the foreign host oocysts are so resistant to digestive action that the sporozoites are not released during the normal length of time that the organisms pass through the intestine.

An investigation on the production of B. abortus aggressin, S. J. SCHILLING and W. L. BLEECKER (*Jour. Infect. Diseases, 40 (1927), No. 4, pp. 469–475*).—This is a contribution from the Arkansas Experiment Station.

The authors found that the injection of a suspension of virulent *Bacterium abortus* into the peritoneal cavity of guinea pigs resulted in the early death of the animals with accumulation of purulent exudate in that cavity. Guinea pigs after simultaneous injection with the centrifugated and phenolized exudate and with a suspension of live cultures presented at two and four weeks no more marked progression of the inoculation disease than guinea pigs receiving the live cultures only; animals receiving larger doses of exudate showed no more advanced pathologic changes than those receiving less. Thus, no aggressin action was observed. Guinea pigs which were given injections,

with exudate and two weeks later were inoculated with live cultures showed no evidence of immunization. This also indicates that the exudate probably contained no aggressin.

The purification of abortin, P. Schoenholz and K. F. Meyer (*Jour. Infect. Diseases, 40 (1927), No. 3, pp. 453–468*).—The authors find that cutaneous hypersensitiveness in abortus-infected guinea pigs may be demonstrated by testing the infected animal intracutaneously with a filtered cell solution of *Brucella abortus*. The substance precipitated by acetic acid in the cold at pH 3.5 to 4.0 elicits allergic reactions as effectively as the original solution. The neutralized supernatant, both unheated and heated, when devoid of this acid precipitable substance is ineffective. Digestion with trypsin destroys the activity of the acid precipitable protein.

Confirmatory evidence that Habronema larvae are not the etiological factor in bursattee, S. B. Freeborn, G. H. Hart, and C. E. Howell (*Jour. Parasitol., 13 (1927), No. 3, p. 220*).—The authors report observations which indicate that the infestation of bursattee lesions by Habronema is accidental and does not constitute the etiological factor.

An infection of man probably due to Salmonella suipestifer, F. W. Shaw (*Jour. Lab. and Clin. Med., 12 (1926), No. 2, pp. 141–144*).—This is a report of a case which occurred in Richmond, Va., in the fall of 1925.

Eggs of Toxascaris limbata, H. Crawley (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 4, pp. 493–497*).—The author reports upon the results of measurements of 2,000 eggs of *T. limbata* and a few observations on the viability of eggs preserved in a sterile medium in the ice box. In one case eggs were found living after 408 days, but the data indicate that they begin to die after a period of about 100 days and that the limit is about one year. Eggs thus preserved apparently never hatch.

Poisonous animals and their venom, E. N. Pawlowsky (*Gifttiere und ihre Giftigkeit. Jena: Gustav Fischer, 1927, pp. XVI+516, figs. 177*).—The first part of this monographic account deals with the poisonous animals, including (1) phanerotoxic animals (pp. 14–458) and (2) cryptotoxic animals (pp. 458–473). Part 2 (pp. 473–488) deals with animals or animal products occasionally poisonous. Lists of references to the literature accompany the accounts of the several classes of animals considered.

Some little-known South African poisonous plants and their effects on stock, H. H. Curson (*Pretoria: So. African Vet. Med. Assoc., 1926, pp. 22*).—A report of studies conducted, together with a list of 64 references to the literature.

Preventing disease in sheep, W. J. Butler (*Mont. Wool Growers' Assoc. Bul. 1 (1927), pp. 11*).—This is a brief practical account.

Observations of lamb dysentery, T. Hare and E. Glynn (*Jour. Path. and Bact., 30 (1927), No. 2, pp. 473–502, figs. 5*).—It is pointed out that this affection has been endemic in northern England and southern Scotland over a long period of years, and probably exists in Europe, Africa, and the United States. The incidence in the flocks studied by the authors was about 26 per cent, with a mortality of 80 per cent. No information regarding the etiology of dysentery, especially whether it is primarily an infection from bacilli of the coli and Welchii types acting conjointly, was obtained from (1) the ewe, by a study of its temperature, urine, and blood, or from chemical and bacteriological analysis of its milks; (2) the lamb, by a study of its temperature, urine, and blood. In the final comatose stage the erythrocytes diminish, the white cells increase in number, and the percentage of leucocytes rises.

[Report of work on paralysis and white diarrhea of chickens at the New Hampshire Station] (*New Hampshire Sta. Bul. 227 (1927), pp. 41–43*).—

In work by E. M. Gildow with paralysis of chickens a lot of 200 pullets was grown and matured on a piece of land where coccidiosis and paralysis had occurred in poultry the preceding year and another of 800 pullets was grown and matured on a piece of land out of contact with any other source of poultry. Regardless of the care that was taken the lot grown on clean land developed coccidiosis to a slight extent during their growing period and subsequently came down in a few instances with paralysis. However, the total number of paralysis cases in the 800 pullets was less than those that developed in the 200 pullets kept on the old piece of land.

In a second experiment two lots of 10 birds each were housed in identical quarters, one being fed 1 cc. of a suspension of embryonated coccidia weekly while the other lot was left clean. At the end of 2 months no definite and unmistakable symptoms of paralysis had developed in the infected pen. At this time the infected pen had lost ⅛ lb. in weight per bird, 6 birds had crooked keel bones, and 3 had died. In the clean pen the birds had gained ⅛ lb. each, only 1 had a crooked keel bone, and none had died. They had laid 163 eggs as compared with 96 eggs for those in the infected pen. In a third experiment two pens of 125 pullets each were used, one of which was cleaned regularly every 7 days and the other once each month. Hens in the pen cleaned weekly laid 5,135 eggs during the period from March 28 to June 23 as against 4,333 eggs laid by those in the pen cleaned monthly. In a fourth experiment paralytic birds and birds suffering from coccidiosis were placed in cages having a false bottom of 1-in. mesh chicken wire and fed all mash, scratch, and water from containers outside the coop. It was found in this way that passage of coccidia from an infested bird would cease about the thirteenth to fifteenth day after it was placed in the coop. Birds suffering from paralysis, however, seldom recovered sufficiently to regain their strength and weight. In one instance two White Leghorn pullets that were showing lameness or the loss of the use of one leg were found to be heavily infested with roundworms and were treated with nicotine sulfate while in one of these special coops. Both of these birds recovered their health and gained in weight, and one of them laid quite a few eggs after the treatment. However, neither of them recovered the use of the paralyzed limb.

The data are considered to indicate that coccidiosis is an extremely detrimental factor in the producing of good healthy stock, and that measures outlined to combat or control coccidiosis assist in controlling paralysis also.

In work with bacillary white diarrhea a pen of 125 pullets which had suffered with the infection as chickens was tested by Gildow at monthly intervals from the fourth month after they were hatched until they were nine months old. Two reactors were found during the fourth month and new reactors as follows: 4 in the fifth month, 3 in the sixth month, 2 in the seventh month, and 1 in the eighth month. Pullets started laying at 4.5 to 5 months of age, indicating that the reaction to the agglutination test may occur before any considerable number of eggs have been laid. In work during the year carried on by A. W. Lohman and W. A. Higgins, 37,600 fowls throughout the State were tested for bacillary white diarrhea infection.

The occurrence of white diarrhea infection in eggs laid by hens reacting to the agglutination test, R. A. Runnells and H. Van Roekel (*Poultry Sci.*, *6 (1927), No. 3, pp. 141–147*).—This is a report of investigations conducted at the Virginia Experiment Station during the months of February, March, and April, 1926, with 14 reacting White Leghorn hens belonging to a flock of high producing birds.

During the course of the investigation 305 eggs were examined, of which 139 were fresh and 166 had been incubated for 1, 2, or 3 weeks. It was found

that 4 of the hens laid eggs in which *Salmonella pullorum* could not be detected, while in the eggs laid by the other 10 hens the infection ranged from 2.8 to 53.9 per cent. The monthly egg production and the monthly egg infection were in inverse proportion. Both low reacting and high reacting fowls laid infected eggs. The percentage of infected eggs detected was 32.6, 15.8, and 7.4, respectively, for the 3 months in the fresh eggs and 32.4, 15.0, and 7.8, respectively, in the incubated eggs. Of the total 305 eggs 14 per cent contained *S. pullorum*. Two of the hens secured for the study died as a result of a bacteriemia due to *S. pullorum*, one at the beginning of the experiment and the other at the end of two months, after having laid 3 eggs in none of which could *B. pullorum* be detected.

Control of eye worm in chickens, D. A. Sanders (*Fla. Grower, 35 (1927), No. 12, p. 23*).—This is a brief account of work at the Florida Experiment Station, in which it is shown that the cockroach *Pycnoscelus surinamensis* L. is the intermediate host of the larvae of the eye worm in that State, as has been reported by Fielding to be the case in Australia (E. S. R., 56, p. 879).

Species and strains of coccidia in poultry, E. E. Tyzzer (*Jour. Parasitol., 13 (1927), No. 3, p. 215*).—The author's studies indicate that acute coccidiosis of the chicken, marked by extensive and often fatal hemorrhage into the ceca and lower intestinal tract, is due to a distinct species to which the name *Eimeria tenella* of Railliet and Lucet is perhaps applicable. Its differentiation is based on the relatively huge size of the schizonts, the large size of the merozoites, deep penetration of the tissues, pathogenicity, localization, and type of development. Coccidiosis in chickens appears commonly to represent a mixed infection, for it is possible to isolate strains of Eimeria which produce only small schizonts and merozoites, developing superficially in the epithelium of the small intestine without invading the ceca or producing hemorrhage. Such strains of Eimeria are practically innocuous, having little effect on the health and growth of young chickens. Since Rivolta and Silvestrini made no mention of hemorrhage in the coccidiosis which they describe, the older name *E. avium*, if available, may be applied to the nonpathogenic type found in the chicken. It has been found impossible to transmit either the pathogenic or nonpathogenic strains of chicken coccidia to young turkeys. These results confirm Johnson's suggestion that the form encountered in the turkey may represent a distinct species, and for this the name *E. meleagridis* n. sp. is proposed.

The agglutinative and antigenic properties of Salmonella pullora and Eberthella sanguinaria, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 3, pp. 370–375, fig. 1*).—A contribution from the Indiana Experiment Station.

The author's first studies of the antigenic and agglutinative properties of the different strains of the microorganisms used were conducted within 30 days from the time they were first isolated. Forty-eight strains of *S. pullorum* were isolated from baby chicks and eleven strains from mature birds. One strain of *E. sanguinaria* was isolated from a baby chick and nine strains from hens that had died of fowl typhoid. In so far as could be determined, no two strains of the same organism could be traced to a single origin.

The organisms were grown on pork-infusion-agar flats, containing 1 per cent of peptone, 1.5 per cent of agar, and 0.5 per cent of sodium chloride and having a pH of 7.4. The 48-hour growth was incubated at 37° C., washed off with physiological salt solution (phenolized 0.5 per cent), and standardized to a turbidity of 3 according to McFarland's nephelometer.

It is pointed out that since certain strains of *S. pullorum* have different agglutinative properties that limit the efficiency of the diagnosis of bacillary white diarrhea in mature birds, such properties should be demonstrable by

testing antigens, each prepared from a single strain of *S. pullorum*, with the sera of naturally infected hens. Thirty such *S. pullorum* antigens and one *E. sanguinaria* antigen were tested with the sera of 20 naturally infected hens from 19 flocks. *E. sanguinaria* antigen ceased to agglutinate above 1 : 200 dilution, whereas the *S. pullorum* antigens cease to agglutinize above a 1 : 1,000 dilution.

In the course of work with approximately 200 antigens, necessitating over 3,000 agglutination tests, no strains of *S. pullorum* possessing agglutinative or antigenic properties deviating from the genera were encountered, with one exception, that of a self-agglutinating organism possessing no other differentiating factors. The results lead the author to conclude that in the practical application of the agglutination test nonantigenic strains of the organism play an immaterial part in the control of the disease. It is also considered evident that *E. sanguinaria* antigen can be used for diagnosing the disease in mature birds, provided reactions in lower dilution be considered as a diagnostic criterion. The results presented on the differentiation of *S. pullorum* and *E. sanguinaria* by means of the agglutination test indicate that the two organisms can be differentiated by means of this test, at least when dealing with the recently isolated strains of the two organisms.

Normal blood counts in pigeons, F. De Eds (*Jour. Lab. and Clin. Med., 12 (1927), No. 5, pp. 437, 438*).—The author reports normal blood counts on a large number of pigeons, which confirm previous reports of great variability.

RURAL ECONOMICS AND SOCIOLOGY

Agricultural problems in their international aspect (*Rome: Internatl. Inst. Agr., 1927, pp. 662*).—This is a document prepared for the International Economic Conference held at Geneva in May, 1927. Included are a brief discussion of the essential elements or factors in agricultural production; tables showing by groups of countries for periods of years the production, exports, imports, consumption, and prices of agricultural products; tables showing by countries the distribution of landed property and agricultural holdings according to size and tenure; tables showing by countries the distribution of the agricultural population by classes and occupations in different branches of agriculture; tables showing by countries the prices of agricultural products and of materials and implements with corresponding index numbers for each product; total index numbers of agricultural products, materials, and implements; data on the profit capacity of farms; and other data obtained in rural economy investigations.

Articles are also included on the marketing of agricultural products and its effect on increasing costs, on what farmers have accomplished by means of cooperation, and on international agricultural credit.

[Papers presented at the seventeenth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 9 (1927), No. 2, pp. 135–237, fig. 1*).—The following papers presented at the meeting held at St. Louis on December 28–30, 1926, are included: The Problem of Inheritance in American Land Tenure, by G. S. Wehrwein; Cotton Futures Markets in Europe, by A. B. Cox; Cost of Production, Supply, and Demand, and the Tariff, by H. Schultz; Joint Cooperative Studies in the Field of Rural Life, by E. L. Kirkpatrick; and Determination of Rural Standards of Living, by E. E. Hoyt.

Agriculture Now? by J. D. Black, a discussion of the Outlook for Agriculture, by E. G. Nourse, previously noted (E. S. R., 57, p. 83); and a paper by C. C.

Costs and profits in producing soybeans in Indiana, E. C. Young and L. G. Hobson (*Indiana Sta. Bul. 306 (1926), pp. 28, figs. 14*).—This bulletin is based upon reports obtained from 104 farms in 1923 and 177 farms in 1924. The farms were located in 10 counties and had an average in 1923 of 18.5 acres in soy beans for grain and 0.6 acre for hay, and in 1924, 16.6 acres for grain and 2.4 acres for hay. The average yield per acre for the two years was 14 bu., and the net cost of growing and marketing on the 4,860.8 acres grown for grain was $1.46 per bushel. The cost of production was between 75 and 99 cts. on 9.9 per cent of the farms, between $1 and $1.24 on 16.6 per cent, $1.25 and $1.49 on 22.4 per cent, $1.50 and $1.74 on 15.8 per cent, and between $1.75 and $1.99 on 9.2 per cent. The effects on costs of yield per acre, time and method of planting, variety, rate of seeding, cultivation, economic use of straw, experience of the grower, and acreage grown, and the use of soy beans and their relation in the farm organization are discussed.

The average yield of soy beans for hay on 487 acres was 1.71 tons, and the average cost of growing and storing $12.05 per ton.

The average labor required for growing and marketing soy beans for grain was man labor 15.6 hours, horse labor 26.3 hours, and tractor work 1.7 hours; and for growing and storing soy bean hay, man labor 15.7 hours, horse labor 28 hours, and tractor work 1 hour.

Tables are given showing unit costs and the distribution of man, horse, and tractor work by 10-day periods throughout the season.

Cost of producing Virginia dark and bright tobacco and incomes from farming, 1922–1925, A. P. Brodell (*Virginia Sta. Bul. 255 (1927), pp. 45, figs. 18*).—This bulletin is based upon cost of production records obtained by a field man for the period March 1, 1922, through the crop year of 1923, and business records kept by farmers during 1922–1925. About 85 per cent of the farms included were operated by owners. A brief description is given of the areas studied, development of the industry, the tobacco outlook, and the conditions existing during the survey.

The 82 dark tobacco farms studied in 1922 and 1923 averaged 154 acres, with 46.8 acres cropped, 8.1 acres of which were in tobacco. The 65 bright tobacco farms averaged 129.6 acres, with 34.2 acres cropped, of which 9 acres were in tobacco. An average of 26.4 months of man labor was required on dark tobacco farms, 42 per cent being utilized on tobacco, 13 per cent on corn, 8 per cent on wheat, and the remainder on hay, livestock, etc. About 50 per cent of the labor was required between May 20 and September 20. On the bright tobacco farms 28.6 months of man labor were required, 65 per cent being used on tobacco, 6 per cent on corn, 5 per cent on wheat, and the remainder on hay, livestock, etc. Fifty-two per cent of the labor was required between May 10 and September 10. The total receipts on dark tobacco farms decreased from $1,964 in 1922 to $1,116 in 1925, there being a decrease of $942 in the receipts from tobacco, $96 decrease in the receipts from other crops, and $232 increase in the net increase in livestock. Although expenses also decreased from $1,107 to $801, operators' earnings (farm income minus 6 per cent on investment, plus value of food, fuel, and house rent furnished by the farm) decreased from $948 in 1922 to $306 in 1925, averaging $673 for the 4 years. The total receipts on bright tobacco farms dropped from $1,688 in 1922 to $841 in 1925, and the total receipts from tobacco dropped $959, while the receipts from other crops and from increases in livestock increased $53 and $88, respectively. Expenses decreased only $149, and operators' earnings decreased from $785 to $80, averaging $410 in the 4 years.

The factors affecting profits in producing tobacco and other crops are discussed and the conclusion reached that tobacco farmers can increase their

incomes by raising more poultry, hogs, and cows; by producing more foodstuffs for family use; by better management of woodlots; and by reducing expenses in producing tobacco and other crops by using larger machinery and barns, abandoning certain lands for crops, using larger fields, etc.

The study was conducted in cooperation with the Bureau of Agricultural Economics, U.S.D.A.

Wool production in California, J. F. Wilson (*Calif. Agr. Col. Ext. Circ. 12 (1927), pp. 42, figs. 10*).—This circular is one of the series previously noted (E. S. R., 57, p. 88). Wool production in California, the grading and classification of wool, factors affecting wool values, preparation for market, and marketing are described.

The dairying industry in Saorstat Eireann (*[Irish Free State] Dept. Lands and Agr. Jour., 26 (1927), No. 4, pp. 279-294*).—A speech of the Minister for Lands and Agriculture outlines the plan of purchase by the Government of the property of the Condensed Milk Company of Ireland (1924, Ltd.) and the reorganization of the entire industry on the basis of cooperative organizations. The 113 creameries, 10 condensed milk plants, and other assets of the company have been purchased by the Government for £365,000. The nonredundant plants are to be sold to existing cooperative societies, or to societies to be organized, at cost. It is planned for the Government to bear by grant from £50,000 to £60,000 of the loss due to the dismantling of redundant plants, and to have the cooperative associations bear the balance, estimated at from £150,000 to £160,000.

Farm taxes and assessments in Massachusetts, H. W. Yount (*Massachusetts Sta. Bul. 235 (1927), pp. 85-120, figs. 4*).—Taxes rank third in importance among Massachusetts farm expenses, being exceeded only by the costs of feed and labor. The study reported in this bulletin is the first of two on farm taxation, carried on in cooperation with the U. S. D. A. Bureau of Agricultural Economics, and covers the amount of taxes paid and the method of making assessments on farm and other property.

Farm real estate on 214 farms in 1923 was assessed at 53 per cent of the owners' valuation, which was a lower percentage than that for urban and industrial real estate. Computed on a similar basis, however, taxes took a larger share of the farmer's income than of the incomes of certain other industrial or professional classes. The inequalities in assessing farm property and the reasons therefor are discussed, and suggestions made for remedying existing conditions.

The ratio of assessed values in 1923 to owners' estimated values in 8 towns in 5 counties varied from 41.9 to 62.4 per cent, averaging 53 per cent. Of 184 farms in 6 towns, 11 were assessed at from 10 to 29.9 per cent of the owners' valuation, 23 from 30 to 39.9 per cent, 43 from 40 to 49.9, 48 from 50 to 59.9, 31 from 60 to 69.9, 24 from 70 to 79.9, and 9 at from 80 to 109.9 per cent. Livestock in 6 towns in 1923 was assessed at from 50.5 to 80.3 per cent of the owners' valuation, averaging 61.5 per cent. Assessed valuations within the same town varied from 35 to 100 per cent of the owner's valuation. The ratio was about 10 per cent higher on lightly stocked farms than on heavily stocked farms.

The average ratios of taxes to farm income in 3 towns from 1920 to 1923 varied from 9.9 to 23.63 per cent, averaging 13.69 per cent.

Survey of the wheat situation, December, 1926, to March, 1927, M. K. Bennett et al. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), No. 6, pp. 263-298, figs. 8*).—A continuation of the studies previously noted (E. S. R., 56, p. 486), including a study of the supply and demand, international trade, marketing and stocks, price movements, prospects for 1927 crops, and the outlook for trade, prices, and carry-overs.

Comparative levels of wheat prices in the United States and Canada, A. E. TAYLOR, E. M. BRAND, and J. S. DAVIS (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), No. 7, pp. 297–316*).—The difficulties of price comparisons and the possible bases of such comparisons between the United States and Canada are discussed. Tables are given comparing by months or 4-week periods for the years 1923–24, 1924–25, and 1925–26 the following wheat prices: (1) Highest cash closing prices of No. 1 Dark Northern Spring at Minneapolis and cash closing prices of No. 1 Manitoba Northern at Winnipeg; (2) highest cash sales prices of No. 1 Dark Northern Spring at Minneapolis and cash closing prices of No. 1 Manitoba Northern at Winnepeg; (3) average of high and low cash closing prices of No. 1 Dark Northern Spring at Minneapolis and cash closing prices of No. 3 Manitoba Northern at Winnipeg; (4) weighted average cash sales prices of No. 1 Dark Northern Spring at Minneapolis and average of high and low cash prices (weighted) of No. 3 Manitoba Northern at Winnipeg; (5) weighted average cash sales prices of No. 2 Hard Winter at Kansas City and average of high and low cash prices (weighted) of No. 3 Manitoba Northern at Winnipeg; and (6) weighted average cash sales prices of No. 2 Red Winter at Chicago and average of high and low cash prices (weighted) of No. 3 Manitoba Northern at Winnipeg; and giving (7) the weighted average terminal prices in the United States of hard spring, hard red winter, and soft red winter wheats combined and the weighted average prices of No. 3 Manitoba Northern at Winnipeg; and (8) average farm prices in the United States and Canada.

The average yearly margin of United States prices over Canada prices and the range of margins by months or 4-week periods are shown in the following table:

Average yearly margin and range of margins by months or 4-week periods of United States prices over Canada prices

Comparisons	Margin of United States prices over Canada prices					
	1923–24		1924–25		1925–26	
	Average	Range	Average	Range	Average	Range
	Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
No. 1	25.7	7.2–31.0	17.1	3.0–31.1	24.0	9.6–44.0
No. 2	28.5	7.8–31.9	19.5	4.1–30.3	28.7	14.6–50.7
No. 3	25.9	6.6–31.4	11.5	2.9–20.4	25.5	17.1–36.6
No. 4	33.0	1.0–35.0	4.0	−6.0–14.0	29.0	19.0–38.0
No. 5 [1]	12.0	1.0–24.0	−21.0	−21.0– 6.0	27.0	9.0–35.0
No. 6 [1]	9.0	8.0–24.0	2.0	10.0–26.0	28.0	4.0–43.0
No. 7	14.4		−7.5		28.1	
No. 8	25.6		5.6		34.3	

[1] Average at Kansas City and Chicago, July to June; at Winnipeg, September to August. Range September to June

Grain trade, cooperatives, and grain exports of the Soviet Union (*New York: Up-to-Date Ptg. Co. [1927], pp. 30*).—This is a report of the Soviet delegation to the International Wheat Pool Conference held at Kansas City, Mo., May 5–7, 1927, and covers the state of grain culture, the organization and state of the grain trade, and the cooperative movement in the Union of Socialistic Soviet Republics.

Milk marketing in Pennsylvania, R. W. BARTLETT (*Pennsylvania Sta. Bul. 208 (1926), pp. 39, figs. 15*).—The study reported in this bulletin analyzes some of the past and present production and marketing practices in Pennsylvania, with a view to determining some of the basic economic principles for marketing milk. It is based on data obtained between October, 1925, and July, 1926, from

Government and State reports on production; from distributors and producers' organizations on price, production, and consumption of dairy prducts; from distributors, railroads, hired haulers, and individuals on costs of transportation, country plant operations, and city distribution; and from questionnaires sent to producers.

The greater part of the bulletin consists of discussions of the transition from the use of milk in butter and cheese to its sale in fluid form, and of milk marketing plans, including the New York classification price plan, the Pittsburgh classification price plan, the Philadelphia basic-surplus price plan, and the Connecticut combination price plan.

The marketing of farm produce.—Part II, Milk, F. J. PREWETT (*Oxford: Clarendon Press; New York: Oxford Univ. Press, Amer. Branch, 1927, pt. 2, pp. VII+84, figs. 10*).—The second of the series previously noted (E. S. R., 55, p. 885). The production and marketing of milk and milk products and their distribution in England and Wales, the organization of producers, and large-scale organization in the United States are discussed. It is forecast that the developments in the milk industry will be increasing specialization of functions of producer, wholesaler, and retailer in all parts of the country, proceeding to organizations of national dimensions.

Hides and skins, J. R. ARNOLD (*Chicago and London: A. W. Shaw Co., 1925, pp. XXIV+606 [pls. 17], figs. [17]*).—This is the first of a series dealing with the raw material markets of the world. Detailed information is given concerning the economic, commercial, and financial aspects of the hides and skins industry.

Exports of farm products (*U. S. Senate, 69. Cong., 2. Sess., Doc. 246 (1927), pp. 18, figs. 4*).—A report, transmitted by the Secretary of Agriculture pursuant to Senate Resolution 356, requesting information as to the chief causes for the reduction in the value of exports of farm products in crude and finished form, the measures being used by the Department of Agriculture to stimulate foreign consumption of American farm products, the cooperation received by the Department from other governmental departments in such work, and the probability of increased demand for American farm products at remunerative prices and of higher prices encouraging larger production.

Agricultural co-operation in the British Empire (*London: George Routledge & Sons, 1925, pp. [5]+28+[8]+254*).—This volume includes the following: (1) A preliminary survey (pp. 1–123) of agricultural cooperation in the British Isles, Canada, Australia, New Zealand, South Africa, India, and other parts of the British Empire, edited by K. Walter for the Horace Plunkett Foundation; (2) the report (pp. 125–254) of the Conference on Agricultural Co-operation in the British Empire, convened by the Horace Plunkett Foundation at Wembly, July 28–31, 1924; and (3) an introduction (pp. 1–28) by H. Plunkett, reviewing the work of the conference.

Year book of agricultural co-operation in the British Empire [1926] (*London: George Routledge & Sons, 1926, pp. VIII+254*).—This is the second of a series of yearbooks, the first of which is noted above. It includes the following articles: Empire Marketing Schemes and Agricultural Organization, by F. L. McDougall; Co-operation in India, by E. Maclagan; The Agricultural Problem in South Africa, by H. Plunkett; Co-operative Production and Marketing in New Zealand; Agricultural Co-operation in Australia; The Irish Movement, by R. A. Anderson; Note on Northern Ireland, by J. J. Johnston; Agricultural Co-operation in Scotland, by T. G. Henderson; and Agricultural Societies in Palestine.

A bibliography of agricultural cooperation is included, as well as a census of agricultural cooperative organizations in the British Empire, showing the

names and addresses of organizations, year of organization, basis of voting, interest on capital, number of members, purposes, nature of commodity dealt with, capital, and value of sales, loans, or premiums in 1924 or last completed year.

This series is edited by the Horace Plunkett Foundation.

The evolution of the English farm, M. E. SEEBOHM (*London: George Allen & Unwin, 1927, pp. 376, [pls. 3], figs. [71]*).—A history of the developments from the neolithic age to the present time.

Agricultural survey, F. QUINONES (*Virgin Islands Sta. Rpt. 1926, pp. 14–17, figs. 2*).—An agricultural survey of the island of St. Thomas shows that over 100 owners of rural property have holdings of from 1 to 1,040 acres, but that 56.2 per cent, or 9,758 acres, of the urban and rural land is controlled by 16 owners. Of the 124 growers of the approximately 176 acres of cultivated crops in 1926, 16 were owners and 108 tenants.

From 1917 to 1926 the number of cattle increased 11.9 per cent, goats and sheep 4.2, mules and donkeys 42.9, and swine 45.4 per cent, while horses decreased 12.3 per cent, the numbers in 1926 being 2,380, 690, 466, 455, and 207, respectively.

Agricultural statistics, 1925 and 1926, R. J. THOMPSON (*[Gt. Brit.] Min. Agr. and Fisheries, Agr. Statis., 60 (1925), Nos. 1, pp. 43; 2, pp. 45–73; 3, pp. 77–138, pl. 1; 61 (1926), No. 1, pp. 72*).—A continuation of the series previously noted (E. S. R., 54, p. 85).

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Does education pay the farmer? F. A. MERRILL (*U. S. Dept. Agr., Ext. Serv., Off. Agr. Instr., [1927], pp. 19, figs. 2*).—A brief mimeographed summarization of the results of surveys made by various investigators and institutions in Georgia, Texas, Indiana, Illinois, Kansas, Iowa, Wisconsin, Missouri, Ohio, Washington, Maryland, and New York. Tables are given showing the relative earnings, labor incomes, size of farms operated, ages at which different incomes are reached, etc., of farmers with various amounts of school training.

Twenty-fourth general report of the Department of Agriculture and Technical Instruction for Ireland, 1923–26 (*[Irish Free State] Dept. Agr. and Tech. Instr. Gen. Rpt., 24 (1923–1926), pp. V+250*).—This report covers the period 1923 to March 31, 1926, and includes reports upon (1) agricultural education, describing the educational institutions, the county and department schemes of itinerant instruction along different lines, and the technical and advisory work of the department in connection with agriculture; (2) agricultural production, describing the schemes for encouraging better breeding of horses, cattle, swine, and poultry, and for agricultural development through loans, credit advances, improved management of cottages and farms, etc.; (3) summaries of laws relating to agriculture; (4) forestry; (5) intelligence and general services; and (6) technical instruction during the period August 1, 1923, to July 31, 1924.

A century of agricultural education (*Un Siècle d'Enseignement Agricole. Paris: Assoc. Amicale Anciens Élèves Grignon, 1926, pp. [5]+270*).—Included are 24 articles describing the organization and work being done by the agricultural schools and other institutions in France and her colonies and the different types of agricultural education carried on.

FOODS—HUMAN NUTRITION

The relation between dietary habits and health of children in rural sections of Virginia, E. A. REYNOLDS (*Virginia Sta. Bul. 250 (1926), pp. 39, figs.*

4).—This publication contains a summary of recent nutrition investigations and a general discussion of the essentials of an adequate diet, followed by the report of an extensive study of the dietary habits and general state of nutrition of rural children in Virginia. The children studied included 115 white preschool children from 3 to 5½ years of age in James City and Roanoke Counties, 462 white school children from 6 to 14 years of age in Roanoke County, and 323 negro school children of Chesterfield, Montgomery, and Elizabeth City Counties. The data on the preschool children were secured largely from health records obtained by the State board of health through its bureaus of child hygiene and mouth hygiene and those on school children from records secured by teachers and by the author. These records were graded (1) on the use of milk, including not only amounts used but the number of years during which milk had been used regularly; (2) the use of green leafy vegetables or tomatoes, either fresh or canned; (3) the use of fruit, either fresh, dried, or canned; (4) the use of coffee; (5) the condition of teeth as regards caries; (6) tooth cleanliness; and (7) the incidence of communicable diseases as determined from school records.

As judged by the arbitrary standards established, the diets as a whole of only 18 per cent of the preschool children and 18 per cent of all the school children could be considered entirely adequate. The diets of 52 per cent of the preschool children, 72 per cent of the white school children, and 71 per cent of the negro school children were considered questionable, and those of 30 per cent of the preschool, 10 per cent of the white school, and 11 per cent of the negro school children unquestionably poor on account of the amount of protective foods used. Sixty per cent of the preschool children, 59 of the white school children, and 70 per cent of the negro school children drank milk regularly, although only 14 per cent of the preschool, 4 of the white, and 2 of the negro school children drank as much as a quart of milk a day. Green vegetables and fruits were eaten daily or at least five times a week by 50 per cent of the preschool children, green vegetables by 19 per cent of the white and 47 per cent of the negro school children and fruits by 49 per cent of the white and 77 per cent of the negro school children, respectively. Coffee was used at least once a day by 38 per cent of the white preschool children, 60 of the white school children, and 10 per cent of the negro school children. The use of candy was a common practice with 61 per cent of the preschool children. The teeth were judged perfect in only 41 per cent of the preschool children, 15 per cent of the white school children, and 40 per cent of the negro school children.

A small degree of positive correlation was found between the condition of the teeth and general adequacy of the diet in both the white and the negro groups, high positive correlations between satisfactory teeth and the larger amounts of milk, and high negative correlations between defective teeth and the larger amounts of milk in the school group. No significant correlation was found between the use of green leafy vegetables and the condition of the teeth in the white group, but a high positive correlation in the negro group between these factors. No significant correlation was found between the use of fruit and the condition of the teeth in any of the groups. Apples constituted the chief fruit, very little citrus fruits being used. Thirty-four per cent of the preschool children had evident signs of rickets. On the whole, the rachitic group had less of the protective foods than the group showing no signs of rickets. Tooth preservation was found to be correlated to some extent with tooth cleanliness, but there was no correlation between perfect teeth and freedom from communicable diseases.

In commenting upon these findings the author takes care to point out the variable factors not under control in this study, at the same time calling atten-

tion to the fact that environmental conditions so far as fresh air and sunlight are concerned were more uniformly satisfactory than would be the case in a similar study of urban children. One of the most interesting findings is considered to be the superior quality of the teeth of the negro children. It is considered that this can not be attributed solely to the diet, although there was a better use of milk, green vegetables, and the pot liquor from the green vegetables and a smaller use of coffee and candy by this group. The fact that the mothers of the negro children are in the habit of working in the fields regularly and are thus exposed to an abundance of sunlight is suggested as one contributing cause of the superior teeth of the negro children of this study.

The value of beef protein as a supplement to the proteins in certain vegetable products, R. Hoagland and G. G. Snider (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp. 297–308*).—Following the methods used in previous studies (E. S. R., 56, p. 290), the authors have attempted to determine the value of the protein of lean beef as a supplement to that of cereal products, legumes, and potatoes. The materials tested were fed in amounts to furnish 10 per cent of protein whether singly or combined, and the feeding was continued for periods of 30 and 60 days.

When fed alone, the proteins of beef, pork, and lamb proved much more efficient than that of wheat, bolted wheat flour, oatmeal, or navy beans. Calculated in gain in weight per gram of protein consumed, the values ranged from 2.96 to 3.15 gm. for rats fed meat proteins as compared with from 1.23 to 2.19 gm. for those fed vegetable proteins in the 30-day period. In the 60-day period an average value of 2.5 gm. was obtained for the meat proteins as compared with values for the vegetable proteins ranging from 1.16 for bolted wheat flour to 1.89 for oatmeal. Of the vegetable proteins, wheat and oatmeal had approximately the same value and navy beans and the bolted wheat flour considerably lower values.

With 5 per cent of beef protein and 5 per cent of various vegetable proteins, the rations in which wheat, bolted wheat flour, corn meal, oatmeal, and rice were used had practically the same value as beef alone, while the ration containing equal parts of beef and navy bean or potato protein had much lower values. Mixtures of one part of beef protein with two parts of wheat, bolted wheat flour, corn meal, and oatmeal, respectively, had about the same value as beef alone.

"Since the protein in beef, as well as in many other animal products, greatly enhances the value of the protein in the grains, it is highly probable that the cereal proteins will be utilized very efficiently when they are included in a mixed diet containing meat or other animal proteins."

A study of the function of oils and fats and emulsions of oil and water in breadmaking, with special reference to gluten formation and modification, E. B. Bennion (*Jour. Soc. Chem. Indus., 45 (1926), No. 49, pp. 435T–438T*).—A study of the effect of peanut oil and of emulsions of this oil with water on the formation of gluten and on the characteristics of the baked loaf is reported. The oil-water emulsions were found to increase the amount of gluten formed from flours to a slightly less extent than the oil alone, an American flour being more affected than patent and straight run English milled flours. The glutens made up with the oil-water emulsions were much lighter in color than those made without oil.

Fermentation was slightly retarded both by oil and by oil-water emulsions, but the doughs rose higher, which is interpreted as indicating a greater elasticity produced by the oil and the emulsion. In baking tests the emulsion yielded a loaf having better color of crumb and pile, the volume, bloom, and general appearance being equal to those of the control loaf. Oil alone gave

a loaf having a whiter crumb than that of the control, but not so white as that of the loaf made with the emulsion. Retention of moisture was better in the oil loaf than in the control and still better in the loaf made with the emulsion.

Human milk studies, I–IV (*Jour. Biol. Chem., 73 (1927), No. 1, pp. 153–208, figs. 13*).—These four papers form a part of an extensive series of studies which are being conducted at the nutrition laboratory of the Merrill-Palmer School on the chemical and biological aspects of human milk production.

I. *Technique employed in vitamin studies*, I. G. Macy, J. Outhouse, M. L. Long, and A. Graham.—A description is given of the technique employed in the preparation and standardization of test rats for vitamin studies and in the determination of vitamins A and B, together with data on the behavior of the test rat on the purified diets, complete or otherwise. The standard basal ration adopted is composed of casein, purified by successive acid and alcohol extraction 18, dextrin 76, Osborne and Mendel salt mixture 4, and agar agar 2 per cent. To make this ration complete it is supplemented by 5 drops (100 to 120 mg.) daily of cod-liver oil to furnish vitamins A and D, 2 drops (40 to 50 mg.) of an anhydrous ether extract of dried wheat germ for vitamin E, and 0.4 gm. of yeast for vitamin B. This ration has been found to be satisfactory for growth and reproduction, but to require from 3 to 5 times as much vitamin B for satisfactory lactation. In the vitamin A studies the cod-liver oil and wheat germ oil are omitted and the ration is irradiated to furnish vitamin D. In the vitamin B studies the yeast is omitted from the complete ration. In the development of the technique for vitamin B evidence was secured corroborating that of Goldberger and others that vitamin B is composed of two factors, both of which are present in yeast.

II. *The quantitative estimation of vitamin A*, I. G. Macy, J. Outhouse, A. Graham, and M. L. Long.—This paper deals with the vitamin A content of mixed human milk obtained from the Detroit Wet Nursing Bureau. In preventive experiments the minimum amount sufficing for growth and prevention of xerophthalmia was 2 cc. For the cure of xerophthalmia and the resumption of growth at a satisfactory rate from 2.5 to 3 cc. was required. Although this amount appeared to be satisfactory as judged by external appearance, a high percentage of the rats on autopsy showed varying respiratory disturbances. For lactation larger amounts, at least 5 cc., were required. The young of rats receiving 2 cc. of the milk daily developed xerophthalmia much earlier than the young of those receiving larger amounts. These results point to the advisability of increasing the vitamin A content of the mother's diet during the lactation period.

III. *The quantitative estimation of vitamin B*, I. G. Macy, J. Outhouse, A. Graham, and M. L. Long.—In the vitamin B studies reported in this paper, both curative and preventive methods were used, but with the larger amounts of milk it was found necessary to deprive the rats of vitamin B for about two weeks before feeding the milk, as otherwise the entire amount was not consumed. From 14 to 15 cc. of the mixed human milk daily was required as the sole source of vitamin B in an otherwise adequate diet to secure even subnormal growth. Even with 20 cc. growth was below the average. Normal ovulation did not take place below this amount. From 25 to 30 cc. of milk was required for normal growth and sexual activity in the younger animals and 35 cc. for continuous growth in larger rats weighing 200 to 240 gm. The young of female rats receiving as much as 35 cc. of milk were subnormal and few survived the nursing period. The addition of 0.4 gm. of autoclaved yeast daily brought about renewed growth in a few rats which had ceased to grow on the milk. This would indicate that it is not the antineuritic fraction of vitamin B which is lacking in milk.

The very low content of vitamin B in human milk suggests the necessity of providing an abundance of this vitamin in the diet of pregnant and nursing women, and as early as possible in the diet of infants.

IV. *A note on the vitamin A and B content of cow's milk*, J. Outhouse, I. G. Macy, V. Brekke, and A. Graham.—For the purpose of comparing cow's milk with human milk as a source of vitamins A and B the content of these vitamins was determined in raw certified cow's milk obtained from a large herd of Holstein cows fed a ration of silage and alfalfa hay, together with a concentrate containing 600 parts of corn gluten feed, 400 of bran, 400 of hominy, 300 of ground oats, 200 of steamed bone meal, and 20 of salt.

In the curative tests for vitamin A, growth was resumed on amounts of 1.5, 2, 2.5, and 3 cc. daily, but the most satisfactory results were obtained with 3 cc. On autopsy single or double mastoid involvement was found in 77 per cent of the rats receiving 3 cc. of milk, showing that this amount does not always protect against secondary infections.

In the vitamin B studies 12 cc. of the milk brought about normal growth for 4 weeks, 16 cc. for 8 weeks, and 20 or 25 cc. for 12 weeks. A daily supplement of 0.4 gm. of autoclaved yeast was without effect, but the same amount of fresh dried yeast brought about an immediate response in growth in the rats which had ceased to grow on 25 cc. of milk. This would suggest that in human milk the limiting factor in the vitamin B is the heat-stable, and in cow's milk the heat-labile, fraction.

A study of the variations in the chemical composition of normal human colostrum and early milk, M. F. Lowenfeld, S. T. Widdows, M. Bond, and E. I. Taylor (*Biochem. Jour.*, *21* (*1927*), *No. 1*, *pp. 1–15*, *figs. 2*).—Data are reported on the day to day variations in the composition of human milk during part or all of the first 14 days of lactation. In all 164 samples from 13 women were examined. The most important variations noted are as follows:

The protein and ash content varied with the day of lactation, being very high in primiparae, less high in multiparae on the second and third days, and dropping rapidly during the first week to an approximately normal level of from 0.98 to 1.3 per cent for the protein and 0.20 to 0.25 per cent for the ash. The sugar content was lowest in the first few days of lactation and rose irregularly to a level of about 6.5 per cent at the end of the second week. The fat content varied with the physicial condition of the breast and the method of extracting the milk but not with the period of lactation. The fat of the milk of primiparae in the first days of lactation was affected in the opposite way by the methods of extraction. The calcium content of the milk varied up to the fifteenth day, but was unaffected by factors local to the breast. The lactose content appeared to be higher at the beginning than at the end of a feed, and some evidence was obtained that the protein content was slightly higher at the end of a feed. The total solids varied roughly as the fat, with minimum and maximum values of from 9.6 to 14.98 per cent.

The vitamins, I–VI, H. C. Sherman (*Jour. Chem. Ed.*, *3* (*1926*), *Nos. 11*, *pp. 1240–1247*; *12*, *pp. 1416–1420*; *4* (*1927*), *Nos. 1*, *pp. 66–72*; *2*, *pp. 214–219*; *3*, *pp. 323–326*; *4*, *pp. 474–478*).—A series of papers summarizing in nontechnical language present knowledge of the vitamins. The first paper deals with nomenclature and vitamin B and the next four with vitamins C, A, D, and E, respectively. The final paper summarizes the more important properties of the various vitamins and gives a table of their qualitative occurrence. Literature references are given at the close of each section.

The stomach oil of the Fulmar petrel (Fulmarus glacialis), O. Rosenheim and T. A. Webster (*Biochem. Jour.*, *21* (*1927*), *No. 1*, *pp. 111–118*, *fig. 1*).—The stomach oil of a young Fulmar petrel (*F. glacialis*) has been shown by color and feeding tests to be about equal to standard cod-liver oil in its content

of vitamin A and to contain vitamin D, the protective dose for rickets lying between 20 and 40 mg. Data on the composition of the oil are reported, showing that it is not a glyceride but a liquid wax of similar composition to sperm oil.

Fat-soluble vitamins.—XXVII, The quantitative determination of vitamin A, H. Steenbock and K. H. Coward (*Jour. Biol. Chem., 72 (1927), No. 2, pp. 765–779, figs. 6*).—In continuation of the studies on fat-soluble vitamins (E. S. R., 56, p. 464), the authors review the literature on the differentiation of vitamin D from vitamin A and the necessity of providing a sufficient supply of the former in testing for the latter, describe the technique which in their experience is the most reliable for the quantitative determination of vitamin A, and illustrate the use of this technique in the study of the vitamin A content of grains. Irradiation of the animals themselves and irradiation of all or part of the basal diet, although satisfactory in many ways, are thought to be a less desirable means of furnishing the antirachitic factor than the use of irradiated cholesterol. The appearance of ophthalmia is considered a better criterion of exhaustion of the animal's store of vitamin A than the cessation of growth. "The two are often simultaneous, but the use of the former criterion prevents loss of animals through the very sudden and rapid decline that may ensue while one is waiting to become certain that growth has really ceased. Growth ceases during the worst stages of ophthalmia and is only resumed when definite improvement in the animal's condition is observable."

With the use of the recommended technique it was demonstrated that yellow corn seeds are richer in vitamin A than was previously supposed and presumably low in vitamin D, and that the vitamin is located in the endosperm rather than in the embryo. Whole wheat, white corn, and oats were low in vitamin A.

The feeding of xanthophyll to rats on a diet deficient in vitamin A, S. G. Willimott and T. Moore (*Biochem. Jour., 21 (1927), No. 1, pp. 86–88*).—Pure crystalline xanthophyll fed to two rats in doses of 3 mg. daily as the sole source of vitamin A did not prevent decline and death with symptoms of vitamin A deficiency within 20 days while control rats on the same basal diet supplemented by 16 mg. daily of cod-liver oil grew satisfactorily. It is concluded that xanthophyll is not identical with vitamin A.

A further note on the antirachitic value of fresh spinach, M. H. Roscoe (*Biochem. Jour., 21 (1927), No. 1, pp. 211–215*).—In a further effort to explain the discrepancy between the antirachitic value of spinach exposed to ordinary sunshine and that irradiated by ultra-violet light from an artificial source, the two theories suggested by Chick and Roscoe (E. S. R., 55, p. 891) were tested (1) by feeding young rats the leaves of the prickly seeded spinach grown in sunlight immediately after picking and before chance of removal or destruction of the vitamin and (2) by using rabbits instead of rats in order to have spinach constitute a larger portion of the diet.

The first of these experiments showed no greater content of vitamin D in freshly picked spinach than in spinach picked the night before, and the second slightly more improvement in the rachitic condition as determined histologically in the rabbits than in the rats of the previous study. These experiments are thought to favor the view that the difference of opinion as to the presence of vitamin D in green leaves is probably due to the difficulty in measuring the small amounts contained.

The vitamin C content of fresh and canned pear, V. C. Graves and M. M. Kramer (*Jour. Agr. Research [U. S.], 34 (1927), No. 4, pp. 385–392, figs. 3*).—In this complete report of the study from the Kansas Station previously noted (E. S. R., 56, p. 894) the minimum protective dose of raw pear for guinea pigs is estimated to be between 10 and 15 gm. daily. Expressed in terms of orange

juice as 100 the potency of the pear is 25. The cold pack method of canning proved slightly less destructive of the vitamin C in pears than the open kettle method, but in no case did the guinea pigs receiving cold pack pear survive the experimental period of 90 days.

The absorption spectrum of cholesterol and its biological significance with reference to vitamin D.—Part I, Preliminary observations, I. M. HEILBRON, E. D. KAMM, and R. A. MORTON (*Biochem. Jour., 21 (1927), No. 1, pp. 78–85, figs. 6*).—From a study of the absorption spectrum of cholesterol before and after irradiation and after fractional crystallization, evidence has been obtained that ordinary purified cholesterol contains another compound in small quantities which can be accumulated in a fraction having the least solubility in ethyl acetate. This substance has well-defined absorption bands at 293$\mu\mu$, 280$\mu\mu$, and 269$\mu\mu$. These bands disappear when the substance is irradiated with ultra-violet light and acquires antirachitic properties. The unknown substance is thought to be closely connected with the vitamin D precursor.

The relation of cholesterol to vitamin D, O. ROSENHEIM and T. A. WEBSTER (*Biochem. Jour., 21 (1927), No. 1, pp. 127–129*).—Cholesterol purified by repeated crystallization, followed by conversion to the dibromide and reduction of the bromide by sodium amalgam in the presence of acetic acid, was found to be inactive as a source of vitamin D after irradiation. "This observation throws new light on the photo-chemical formation of vitamin D. It is evident that the precursor of vitamin D is not cholesterol itself, but a substance which is associated with and follows 'chemically pure' cholesterol in all its stages of purification by the usual methods (esterification, saponification, and recrystallization)."

The effect of excessive radiation with ultra-violet light upon the growth of rats, J. L. LEIGH-CLARE (*Biochem. Jour., 21 (1927), No. 1, pp. 208–210*).—Covering the eyes of rats exposed to ultra-violet light was found to prevent the conjunctivitis which is apt to appear on prolonged irradiation. With this protection, exposure of young growing rats to ultra-violet light for periods up to 30 minutes daily was found to have no harmful effect upon growth and well-being. Exposure for this length of time was no more beneficial than shorter periods. It is considered preferable to provide vitamin D by including an irradiated fat in the diet rather than by direct irradiation of the test animals.

The persistence of botulinum toxin in discarded canned foods, W. A. STARIN (*Jour. Infect. Diseases, 40 (1927), No. 5, pp. 579–584*).—To determine whether botulinum toxin persists in discarded cans known to have contained the toxin, peas, corn, and salmon were canned under commercial conditions, inoculated with *Clostridium botulinum*, and incubated until toxin had formed. Some of the material was smeared over the surface of clean sterile cans and exposed to light, moisture, and temperature changes similar to those which might occur with discarded cans.

The toxin proved stable under all the conditions tested. "The practical significance of this stability of the toxin is evident. Although negative findings can not be accepted as conclusive, it is reasonable to expect to find demonstrable toxin in discarded vegetables and meats, if they were originally toxic, even after relatively long periods of time. The fact that materials submitted for examination may reach the laboratory in a dried condition does not preclude the possibility of demonstrable botulinum toxin."

TEXTILES AND CLOTHING

Absence of uniformity in growth of the merino fleece, J. O. DUERDEN and V. BOSMAN (*Jour. Textile Inst., 18 (1927), No. 5, pp. T191–T194, figs. 2*).—

Measurements at Rhodes University College demonstrated that the fleece of the merino rarely grows uniformly throughout the year, the growth being less vigorous toward the end of the season than at any other period. The wool toward the bottom of the fleece is the finest. See also an earlier report (E. S. R., 54, p. 896).

A microchemical study of the structure and development of flax fibers, D. B. Anderson (*Amer. Jour. Bot., 14 (1927), No. 4, pp. 187–211, pls. 4*).—Flax fibers were studied both chemically and structurally during their formation within the plant in an investigation at the Ohio State University. In addition to the information recorded from another source (E. S. R., 55, p. 493), the author observed that tension on the fiber brings about different angles of inclination of the fibrils. Flax fibers are partially lignified when seen in the stem, the lignification being local and confined to the middle lamella and secondary wall, rarely entering the tertiary deposits. Lignification is a change of pectic compounds, and evidence exists that some change of cellulose to pectose occurs previous to lignification. Lignification progresses with the age of the plant. Retting appears to be accomplished by the destruction of the entire secondary wall and not by dissolution of the middle lamella. Lignification interferes with retting, and the degree of lignification is one of the determining factors in the success of the retting process.

The weight per centimetre of the ultimate fibre of flax, G. F. New and S. Alty (*Jour. Textile Inst., 18 (1927), No. 5, pp. T187–T190*).—Studies under the auspices of the Linen Industry Research Association showed that the ultimate fibers in flax and similar fiber strands can be separated by treatment with dilute caustic soda solution. By examining a section of material of known length and weight the weight per centimeter of the ultimate fibers can be determined.

Ultimate fibers with the greatest weight per centimeter are to be found in the root end of scutched and hackled flax, in root tow as opposed to top tow from the hackle, and in the shortest strands in a sliver. Apparently spinning quality in ordinary flaxes does not depend on the weight per centimeter of the ultimate fiber, since this feature showed no significant variation throughout a range of materials extending from 12 lea (4 lbs.) to 200 lea.

MISCELLANEOUS

Report of the Hawaii Agricultural Experiment Station, 1926, J. M. Westgate et al. (*Hawaii Sta. Rpt. 1926, pp. [2]+26, figs. 20*).—This contains the organization list, a summary by the director as to the work of the year, and reports of the divisions of horticulture, agronomy, and chemistry, the extension and demonstration work on the Island of Hawaii, boys' and girls' club work, and the Haleakala Substation and Demonstration Farm. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Progress of agricultural experiments: [Report of director of New Hampshire Station], 1926, [J. C. Kendall] (*New Hampshire Sta. Bul. 227 (1927), pp. 45*).—This contains the organization list, a report of the director on the work of the station, and a financial statement for the fiscal year ended June 30, 1926. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Virgin Islands Agricultural Experiment Station, 1926, J. B. Thompson et al. (*Virgin Islands Sta. Rpt. 1926, pp. [2]+18, figs. 7*).—This includes the organization list, reports by the director, the horticulturist, and the agronomist as to the work of the station for the fiscal year ended June 30, 1926, and a special report on work in St. Thomas. The experimental work reported is for the most part abstracted elsewhere in this issue, as are also meteorological observations.

NOTES

Arkansas University and Station.—What is believed to be a new national record for continuous egg laying was recently made in the station egg-laying contest. The new record is 149 consecutive days, the holder being Lady Lindy of Inglenook, a Single Comb White Leghorn hen.

Effective September 1, Mrs. Henrietta K. Burton has been appointed head of the department of home economics and Robert M. Smith instructor in poultry.

Connecticut State Station.—The annual field day was held June 3 on the station grounds, the principal address being given by Dr. G. F. Warren of Cornell University. The tobacco field day was held at the Windsor Substation August 2.

Willis R. Hunt, Ph. D., has resigned as scientific assistant in botany to accept a position with the New York Conservation Commission. Recent appointments include George L. I. Zundel as assistant in botany, H. J. Lutz as assistant forester, J. P. Johnson in charge of Asiatic and Japanese beetle quarantine, W. R. Singleton as assistant geneticist, and T. R. Swanback as scientific assistant at the Tobacco Substation.

Georgia Station.—W. A. Morgan has resigned to become State chemist and has been succeeded as associate chemist by K. T. Holley. J. E. Bailey has been appointed assistant horticulturist vice J. G. Woodroof, who has been granted leave of absence for nine months to take up graduate work at the Michigan College. R. M. Middleton and W. T. Fullilove, recent graduates of the Georgia College, have been appointed to do special work in marketing investigations, the former with peaches in cooperation with the Georgia College and the latter with cotton in cooperation with the U. S. Department of Agriculture.

Iowa College.—Raymond M. Hughes, president of Miami University since 1913, has been appointed president.

Kansas College.—*Science* states that L. E. Melchers, head of the department of botany and plant pathology, has been granted leave of absence beginning about September 1 for one year to undertake special work in plant pathology for the Egyptian Government.

Michigan College and Station.—Graduate assistants have been appointed as follows: Dr. Charles F. Gibbs and Frank Forbes in bacteriology vice Howard W. Koch and E. P. Johnson, respectively, and D. B. Myers in pathology vice E. R. Carlson. Lois Munn and Marion Lewis have been appointed instructors in clothing and Sylvia Metzger instructor in foods.

Mississippi Station.—The people of Adams County have raised funds and solicited the aid of the station for pecan investigations, and these are proceeding in charge of W. T. Mallory. There are many thousand native pecan trees in the region, and one of the most important phases of the project is to bud or graft the better varieties on these native trees.

Fertilizer investigations with truck and fruit crops are being carried on at the main station and the Raymond Substation. Funds for the salary of the project leader, J. L. Cooley, and incidental expenses are being supplied by the Chilean Nitrate Agencies, while the station furnishes land and similar assistance.

George S. Templeton, for the past four years head of the animal husbandry department, has also been appointed assistant director. Miss Olive Sheets has been appointed food specialist in the home economics department.

Montana College and Station.—H. W. Vaughan, professor and animal husbandman in charge of beef cattle investigations in the Minnesota University and Station, has been appointed head of the animal husbandry department.

Rutgers University and New Jersey Stations.—The annual field day held June 15 broke all previous records for attendance, the total approximating 3,500 persons.

The department of plant pathology has undertaken a new project on the diseases of ornamental plants. A special appropriation for this work has been made by the State legislature.

Willard H. Allen, extension specialist in poultry husbandry, has resigned to engage in commercial work. Robert G. Connelly has been appointed assistant extension specialist in dairy husbandry, vice E. A. Gauntt, resigned. Other resignations include Forest H. T. Clickner, research assistant in poultry husbandry, on May 15, and L. A. Stearns, assistant entomologist, on May 1. Recent appointments include Dr. E. P. Johnson as assistant poultry pathologist, Dr. Byrley F. Driggers as assistant entomologist, Henry M. Biekart as associate in ornamental horticulture, and William S. Muller as research assistant in dairy husbandry. Clarence S. Platt has been transferred from poultry specialist to assistant poultry husbandman.

New York Cornell and State Stations.—F. B. Morrison, assistant director of the Wisconsin Station, has been appointed director of the Cornell and State Stations, effective October 1, succeeding Dr. R. W. Thatcher, whose resignation to accept the presidency of the Massachusetts College has been previously noted. It is expected that Director Morrison like his predecessor will reside at Geneva, spending such time at Ithaca as the administrative duties there may necessitate.

The nursery stock investigations begun at Geneva this spring are giving promise of practical results. Several hundred seedling stocks for fruit trees have been successfully propagated on the station grounds. The primary object of this project is to aid the American nursery industry to establish a domestic supply of rootstocks in anticipation of a Federal quarantine prohibiting the importation of foreign nursery stock after 1930. Attention is being given principally to the production of apple and cherry stocks, but other fruits and other types of nursery stock will receive consideration as the work gets under way.

Dr. R. J. Anderson, chief in research (biochemistry), has resigned, effective October 1, to accept a professorship in chemistry in Yale University, where he will continue the studies on the chemical properties of the tubercle bacillus begun during his leave of absence at that university for the past year. The resignations are also noted of Dr. R. L. Shriner, associate in research (biochemistry), to accept a position October 1 in the department of chemistry at the University of Illinois, and Miss Elizabeth F. Hopkins, assistant in research (botany), effective September 1, to accept an appointment from the Massachusetts Station to organize a seed-testing laboratory.

North Dakota Station.—Clarence H. Plath has been appointed superintendent of the Hettinger Substation vice U. J. Downey, resigned. Miss Astri Frisak has been appointed seed analyst.

Pennsylvania College and Station.—The resignations are noted of W. H. Tomhave, head of the department of animal husbandry, effective June 30; R. W. Bartlett, assistant in agricultural economics, effective June 30; and W. B. MacMillan, assistant in forestry, effective July 31. C. D. Jeffries has been transferred from the Institute of Animal Nutrition to the department of agronomy in

the college and station as assistant professor of soil technology, effective August 1. Carl Oscar Dossin has been appointed assistant professor of poultry husbandry extension, effective September 1, and Paul I. Wrigley, instructor in agricultural economics, effective July 1.

South Dakota College and Station.—Alfred L. Bushey, assistant professor in agronomy and assistant agronomist since 1921, died June 6 at the age of 38 years. He was a graduate of the college in 1914 and received the M. S. degree from Purdue University two years later. His work for the station had been mainly as analytical chemist.

Tennessee University and Station.—Miss Nellie Crooks, director of the department of home economics, has resigned and has been succeeded by Miss Jessie W. Harris, previously professor of home economics. R. B. Lowry, associate professor of agronomy, has resigned, and Dr. Russell Austin has been appointed assistant professor of agronomy. Charles M. Wheeler has been appointed instructor in entomology, Walter W. Stanley assistant entomologist in the station, and Newman Hancock assistant in botany.

Texas College and Station.—The needs of the station received sympathetic consideration by the State legislatnre at both its regular session and a subsequent special session. Appropriations of $35,000 for the study of cotton root rot disease and $15,000 for cotton insect investigations, particularly the cotton flea hopper, were made to enable the beginning of extensive investigations during the fiscal year ending August 31, 1927. For the ensuing biennium, the research work was granted $351,364.70 for 1928 and $334,714.70 for 1929. The total exceeds by $161,703.82 any previous State appropriation. It is largely allotted for specific projects, the cotton root rot stndies being granted $52,750 the first year and $47,750 the second year of the biennium and the cotton insect studies $25,000 for each year.

The personnel of the board of directors of the college and station has been considerably changed, G. Raleigh White of Brady, W. T. Montgomery of San Antonio, and A. J. Keist of Dallas succeeding Walter H. Boothe, Mrs. J. C. George, and S. A. Lillard, respectively.

Washington College and Station.—The unfinished portions of the James Wilson Hall, the agricultural building, have now been completed and many improvements effected. The first unit of a new range of greenhouses is being built, and will be devoted primarily to experimental work in plant pathology and agricultural bacteriology. An additional laying house accommodating approximately 800 birds is being constructed at the college poultry plant.

Dr. J. R. Magness, physiologist in storage and transportation investigations of the U. S. Department of Agriculture, has been appointed head of the department of horticulture in the college and of the division of horticulture in the station beginning September 1. F. L. Overley, assistant professor of horticulture, has been transferred to station work, with temporary headquarters at Wenatchee. A. H. Rishoi, assistant professor of dairy manufactures, has resigned to engage in commercial work and has been succeeded by H. A. Bendixen as associate professor of dairy husbandry and associate in dairy manufactures in the station. Chester C. Hampson has been appointed assistant agricultural economist in the station vice G. H. Fredell, resigned to accept a teaching position in the Oregon College. B. F. Dana, assistant professor of plant pathology and assistant plant pathologist, has accepted a position as plant pathologist in the Texas Station.

Ohio-Mississippi Valley Forest Experiment Station.—Headquarters for this station, operated by the U. S. D. A. Forest Service as one of its regional stations, have been selected at Columbus, Ohio, in affiliation with the Ohio State University and the Ohio Agricultural Experiment Station. The region

to be covered includes Ohio, Indiana, Illinois, Iowa, Missouri, western Kentucky and Tennessee, and northern Arkansas, and a series of branch stations will be established in this territory. Field work has already been begun with a study of the growth of oaks in the vicinity of Portsmouth, Ohio. The initial appropriation of $30,000 will permit of a technical staff of five men. E. F. McCarthy, assistant director of the Appalachian Forest Station at Asheville, N. C., has been appointed director.

American Society of Agricultural Engineers.—This society held its twenty-first annual meeting at the University of Minnesota from June 22–25. The opening day was given over to sessions of the rural electric and reclamation divisions. The first of these sessions opened with a short address by the chairman of the division, A. Huntington, on The Contribution Which the Agricultural Engineer is Making to the Agricultural Industry and to Farm Life. This was followed by reports of the committee on wiring, by B. P. Hess, and the committee on farm lighting, by W. C. Brown. A paper which aroused unusual interest was that on the feed grinding investigations at the Wisconsin Station, given by W. C. Krueger. E. A. Stewart of the Minnesota Station presented an illustrated address on Rural Electrification in Europe. Reports by Miss E. Davison of the Iowa Station on household appliances and by T. E. Hienton of the Indiana Station on correlation were also features of committee activities.

The results of farm refrigeration studies in New Hampshire were presented by W. T. Ackerman of that station and discussed at length by E. C. Easter of the Alabama Station. A paper on the electric rural rate problem, given by M. T. Wilcox and discussed by E. R. Meacham, both representing large private corporations, brought out a substantial agreement as to fundamentals of cost, but indicated that different methods are employed in the application of these principles to the rate schedules. A paper by G. C. Neff on Taking Power and Light to the Farm followed one on Developing Methods and Equipment for Extending the Use of Electricity in Agriculture, by C. H. Churchill.

The outstanding feature of the program of the reclamation division was the evidence presented of unusual activities of the committees during the year. Those reporting included drainage in humid regions, through Q. C. Ayres of the Iowa Station; drainage of irrigated land, through J. C. Marr of the U. S. Department of Agriculture; soil erosion, through G. Muehleisen; forestry, through L. F. Livingston of the Michigan Station; land clearing, through W. A. Rowlands of the Wisconsin Station; irrigation, through G. S. Knapp; and run-off from agricultural lands, through C. E. Ramser of this Department. The technical papers presented before this division included Subsoil as a Factor in Drainage Design, by Dr. S. A. Norling; Silting of Drainage Ditches: Its Control and Prevention, by R. N. Towl; Influence of Growth on Flow in Open Ditches, by C. E. Ramser; and Alkali Land Reclamation, by J. C. Marr and M. R. Lewis, the latter of the Idaho Station.

The second day was devoted entirely to general sessions, at one of which Dean and Director W. C. Coffey of Minnesota discussed the significant changes taking place in agriculture. O. W. Sjogren of the Nebraska Station presented the president's annual address, in which special attention was drawn to the importance of the organization and development of more fundamental research in agricultural engineering. This address was followed by a review and analysis of the status and progress of agricultural engineering research during 1926, by R. W. Trullinger of the Office of Experiment Stations. A gradual improvement in the character of investigations in the subject was noted.

Other addresses at this session dealt with the Economic and Moral Influence of Drainage and Flood Control on the Community, by E. V. Willard of the

Commission of Drainage and Waters of Minnesota; and Engineering and Agriculture, by L. W. Wallace, executive secretary of the American Engineering Council. R. E. Murphy also presented a large amount of data from actual experience in solving the labor problem in farming operations by engineering procedure.

The third day was devoted to simultaneous sessions of the farm power and machinery and the farm structures divisions. The program of the former division featured a report on progress in the correlation of research in mechanical farm equipment, by H. B. Walker of the Kansas Station, and an analysis of farm production costs from an engineering standpoint, by J. B. Davidson of the Iowa station. E. G. McKibben of the California Station presented an analytical discussion of the kinematics and dynamics of the wheel type farm tractor, based on extensive laboratory studies at that station. R. I. Shawl of the Illinois Station discussed mechanical equipment for the cultivation of row crops, and A. E. Brandt of the Iowa Station reported the results of a preliminary study of the relation between form and power in the horse, based on horse pulling contest data. C. O. Reed, of the Ohio Station, who was engineer in charge of the recent corn borer control campaign of this Department, reported briefly on this activity.

The outstanding feature of the session of the farm structures division was the discussion of the relation between farm building overhead cost and the cost of production, following a paper on this subject by J. H. Swenehart of the Wisconsin Station. In line with the effort of the division to place the study of farm building problems on a more fundamental basis, a suggestive report was presented by M. C. Betts of this Department on the promotion of research in farm structures. This was followed by a discussion led by W. G. Kaiser which resulted in the development of a program of farm structure studies.

The last day of the meeting was occupied with sessions of the college division, and was opened with an address on Recent Developments in College Instruction Methods, by Dr. A. V. Storm of the University of Minnesota. Other papers took up the Possibilities and Relationship of the College Agricultural Engineering Departments and Secondary School Education, by E. W. Lehmann of the Illinois Station; Logical Policies for Juvenile Extension Programs, by I. D. Wood of the University of Nebraska; and What Agricultural Engineers Can Contribute to Home Economics Instruction, by Miss E. Davison. The session closed with educational demonstrations, including farm machinery laboratory instruction, by the agricultural engineering faculty of the Iowa State College, and a rural sanitation project by E. A. Stewart.

Three field demonstrations were given on the University Farm, dealing respectively with the Iowa torque dynamometer, a tractor guide, and a big team hitch. Inspection trips were also made to the experimental peat plats of the Minnesota Station, and to certain experimental farm buildings.

The officers elected for the ensuing year are president, O. B. Zimmerman; vice presidents, A. Huntington and D. G. Carter, the latter of the Arkansas Station; secretary-treasurer, R. Olney; and council member, A. H. Hoffman of the California Station.

Western Society of Farm Economics.—This organization was established when farm economists of 11 Western States met at Reno, Nev., June 22 and 23, conjointly with the Pacific division of the American Association for the Advancement of Science. The purpose of the society is announced as to promote understanding among western farm economists relative to economic problems in their respective States, the methods used in studying these problems, and the progress made toward their solution. It will also aim at coordination of effort where this is practicable.

The first day's session was largely spent in a consideration of the active projects in agricultural economics as outlined by delegates of the States represented. Suggestions for coordination of work and standardizing methods of investigation were offered by B. H. Critchfield of the U. S. D. A. Bureau of Agricultural Economics.

On the second day the following papers were presented: Investigations in Farm Management, by G. L. Sulerud of Idaho; Investigations in Cost of Production, by R. T. Burdick of Colorado, R. M. Clawson of Nevada, and H. D. Scudder of Oregon; Marketing Problems, by R. L. Adams of California; Factors Affecting the Supply of Farm Products, by E. Rauchenstein of California; Need of Statistical Measurements in Determining and Correctly Interpreting the Irrigation Situation, by Charles H. West of California; and Collecting and Disseminating Economic, Statistical, and Marketing Information, by L. R. Breithaupt of Oregon.

The following officers were selected for the ensuing year: F. B. Headley of Nevada, president; H. D. Scudder of Oregon, vice president; and P. V. Cardon of Utah, secretary-treasurer.

World Agricultural Census.—According to a note in *Science*, an agricultural census of the world is contemplated under the direction of L. M. Estabrook of the International Institute of Agriculture. This will be the first attempt to obtain a census of this sort. Of the 200 countries listed by the institute, only 60 have ever taken an agricultural census and only 40 of these since 1900.

Miscellaneous.—The Second International Conference for Plant Protection has been scheduled to meet in November, 1928, to coincide with the Ninth General Assembly of the International Institute of Agriculture.

The Southeastern University of Nanking has been reorganized as the Fourth Chungshan University, with ten colleges, one of which is the College of Agriculture.

C. W. Howard, director of the Kwangtung Provincial Bureau for the Improvement of Sericulture, who for the past ten years has been developing the silk industry of southern China, has been appointed head of the department of biology of Wheaton College. It is expected that he will return to the work in China each summer for the next few years.

Science notes that Sir Daniel Hall retired June 4 as director general of the intelligence department of the British Ministry of Agriculture, a position which he had occupied since 1920. He will continue to act as scientific adviser and chairman of the research council of the ministry.

Dr. C. L. Huskins of the botanical department, University of Alberta, has been appointed to a research position in the John Innes Horticultural Institution at Merton, England.

H. J. Page has resigned as chief of the chemistry department of the Rothamsted Experimental Station to head the research laboratories of Nitram, Ltd.

EXPERIMENT STATION RECORD

VOL. 57 OCTOBER, 1927 No. 5

Although summer conferences on the agricultural college campus have long since ceased to be a novelty, there were at least three gatherings during the past season of more than the usual interest. One of these was the Country Life Week at the Michigan State College, which included the tenth annual meeting of the American Country Life Association, a large number of auxiliary groups, and the Second International Country Life Conference. Another was the Institute of Chemistry of the American Chemical Society held at the Pennsylvania State College, and the third was the New England School of Marketing and Institute of Cooperation at the Connecticut Agricultural College. While the constituency, the method, and the immediate aims of each of these three groups were quite unique and distinctive, they were all successful in arranging programs of much merit and in bringing together a goodly company of the present and prospective leaders in their respective fields. Brief notes regarding the Connecticut and Pennsylvania institutes are given elsewhere in this issue.

The Michigan meetings covered the period from July 27 to August 6, 1927, inclusive, but the central feature was a four-day conference of the American Country Life Association, meeting jointly with the American Farm Economic Association, assembling 632 delegates from 33 States and 25 foreign countries, and representing no fewer than 161 separate organizations. Many of these groups, State, regional, national, and international, held more or less extended individual meetings, and the aggregate attendance is estimated at over 5,000 men and women.

One of the sessions was held in conjunction with the annual farmers' day, which despite an unexpected conflict with harvesting demands attracted about 4,000 farmers and their families. Other groups in attendance included the summer school for town-country ministers, the Fifth Annual Catholic Rural Life Conference, a conference of town and country laymen and employed officers of the Y. M. C. A.,

a regional conference of community church workers from the States of Michigan, Ohio, and Indiana, and a conference on the Michigan rural church and rural community; the World Agriculture Society; the Michigan Country Life Association; the National Conference of Master Farmers; the Ninth Annual Conference of Vocational Agricultural Teachers; a three-day school of cooperation; the Michigan Rural Education Society; the Michigan Farm Woman's Institute and a citizenship conference under the auspices of the Michigan League of Women Voters; and a national school of leadership for students interested in rural life. The bringing together of these many and varied groups was in itself no small achievement and gave opportunity for an unusually broad and comprehensive consideration of the rural problem.

The general theme before the conference was farm income and farm life, and this was considered quite fully by sociologists, economists, extension workers, and leaders in other more or less specialized lines. The basis of the discussion was a symposium on the relation of social and economic factors in rural progress. This symposium had been prepared during the past three years by more than 40 collaborators under the direction of a joint committee of the two associations, and has been published in book form with the financial assistance of the Institute of Social and Religious Research. Both the book and the conference represent an earnest and coordinated effort to "interlock the social and economic aspects of farming and farm life."

The keynote of the conference was sympathetically sounded in the opening address by the Secretary of Agriculture, entitled Certain Aspects of the Agricultural Situation. In this address Secretary Jardine discussed the steady drift from the farm to the towns and cities, referring to a survey recently completed by the Department of farmers moving to town between 1917 and 1926. In the survey the reasons given for the change were economic betterment in 37.8 per cent of the cases, old age and physical disabilities in 25.2 per cent, and the opportunity to give children better schooling in 10.9 per cent.

Some of these adjustments, as he made clear, indicated a healthy movement which need not operate to the disadvantage of agriculture, nor, so long as there is adequate production, is the main public interest in reducing the movement numerically. The problem is rather "to keep on the farm those men and women who know rural life, who love it, and who can contribute substantially to its development."

Secretary Jardine went on to discuss the situation mainly from a sociological point in view. "The prosperous farmer," he pointed out, "takes to the city with him his years of experience and educa-

tion in business-like farming, his wealth which was produced on the land, and his desire to live a more comfortable life. The rural neighborhood, school, club, church, and local government lose a substantial supporter. Even if he retains ownership of the farm, his income from the land is usually spent in the city. Should he sell the farm outright, that wealth goes to build up the city and its business. By remaining on the farm, the fairly well-to-do man could do much to raise the standard of living in his community."

Many of these people are leaving the country, he believed, "partly because we are not emphasizing in a big enough way the real advantages of rural life, partly because we have not made the American countryside what we ought to make it. . . . We go on draining the country, the source of much of our spiritual as well as economic resources, and we are putting very little back."

While the outstanding need of obtaining an economic reward from farming commensurate with that from urban enterprises was fully recognized, the principal remedy which he suggested was the development of an adequate program, effectively financed, to get for the farmer those facilities for education, recreation, and entertainment that he desires. "As I see it," he said, "if we are to develop a fuller and richer rural life, if we are to make farm life and the farm home sufficiently attractive to keep the best farmers in the rural communities, we must pay more attention to the technical principles of rural consumption; that is to say, we must assist the rural communities to achieve the highest possible standard of living on their income."

Secretary Jardine made clear his realization that "it takes more than fresh air and the songs of birds to build the type of rural civilization we all want." As he pointed out, "cities have technical experts in many lines of living who work out the principles of consumption on a high level for the masses. Individuals in cities do not work out these problems for themselves, even though they have the money to pay for a high standard of living. The masses depend on an army of experts in many phases of health, architecture, sanitation, public utilities, municipal government, education, information, play, art, religion. The farmer has few, if any, of these experts and he can not individually draw experts to his aid." In his opinion, "a plan to equip the country with the institutions of health and culture and facilities for education and entertainment deserves an application of brain power coequal with the brain power applied through agricultural colleges and governmental agencies to achieve on the farm more efficient production and greater financial returns." Specifically he called for expert assistance to farmers in working out the principles of consumption, the devising by commercial agencies and others of modern appliances adapted to conditions in the farm home, a dis-

tinctive and appropriate farm architecture, and a general reversal of the situation where "leaders place all the emphasis on the city and are willing to assist rural life only if the country will adopt what has been worked out for the city."

The program of the conference included both formal papers and addresses and many round table and similar informal group discussions. These embraced such subdivisions of the general topic as education, health, recreation, religion, family needs, and legislation in their respective relations to income and standards of living.

One of the most useful features of the entire conference was a presentation toward its close of a summary by Dean Mann of Cornell University of the chief points of emphasis throughout the discussions. Among the more specific accomplishments he cited the active participation by farmers and farm women in the meetings, thereby initiating a fuller cooperation with professional workers of great potential promise. The acceptance of a merging of the economic and social aspects of farm income and farm life into a common concept of the standard of life in the country is, he declared, another significant advance, tending to "a singleness of objective, a wholeness in the conception of life, which will come in time to have marked influence on both economics and sociology as fields of inquiry and in personal and community programs of action."

On the economic side greater efficiency in production was regarded as less the present need than a more equitable distribution of wealth, since in agriculture the benefits of increased efficiency are diffused among consumers. Similarly it was thought that trade agreements and cooperative action must be developed among farmers, as with unlimited competition they will not receive their equitable share of the national income.

From the sociological point of view, the general acceptance of the concept of farming as a mode of life as well as an occupation is deemed most helpful; "a sort of mobilization center for all the working forces, economic, sociological, and psychological. . . . It is a contribution to progress when we clarify our thinking by interpreting success in farming in terms of the standard of life sought and the quality of life attained by the farm family rather than merely by financial returns."

The interrelationships of country and urban life were pointed out, although it was admitted that in the United States to-day "the city is dominant in the national life and industry is in the saddle." None the less is it true, as President Butterfield of the college declared in his address as head of the American Country Life Association, that there must be a general recognition that the rural problem is of quite as much concern to the cities as to the countryside itself. "Urban wealth," as he put it, "must help support rural institutions,

roads, schools, churches, and hospitals, not merely as a matter of philanthropy but chiefly on the principle that the total social wealth must be utilized for the total social health." May we not then, as Dean Mann suggested, "harmonize our conceptions of farm income and farm life and of social justice into a single objective, and agree that agricultural progress is to be found in the process of achieving on the part of the people living on farms in ever greater amount and juster proportion the higher levels of wealth, health, knowledge, beauty, sociability, and righteousness which we as a people have set as worthy of our loftiest desires and highest efforts?"

The international implications of such a program were greatly augmented by the attendance and participation in the conference of the members of the International Country Life Commission and by the three-day sessions under its auspices of the Second International Country Life Conference toward the close of Country Life Week. This commission, organized largely through the efforts of Hon. Paul DeVuyst, director general of agriculture in Belgium and widely known for his long and active interest in the promotion of agriculture and country life, has for its practical aim the raising to a high level the standard of living of farm families in all lands. Its registration of representatives of 25 foreign countries and 25 States of the Union was a material increase over its initial meeting in Brussels in 1926, when 18 countries were represented, and indicates an increasing appreciation of the importance of the commission and its opportunities for service. Its program included numerous addresses depicting rural life and its problems in various foreign countries, as well as a discussion of Some New International Movements in Rural Affairs, by Director DeVuyst; The International Habit of Cooperation, by President Butterfield; and The Fundamental Problem in Country Life, by Dr. L. H. Bailey.

As the days go by the complexity of the rural problem is being more and more freely acknowledged, and there is increasing agreement that its effective and permanent solution will require the concerted efforts of workers in many fields. To the sociologists in particular, however, the situation constitutes an immediate challenge and opportunity. That this responsibility is being widely recognized and accepted by them is attested by the numerous projects already under way on various phases of the subject by station and Department workers, but it is not likely that the need has been fully satisfied. By bringing together so many of those interested and focusing public attention so directly on the vital national significance of the issues, the conference and its auxiliary meetings have rendered a timely service and one which should appreciably stimulate and intensify the activities of all who are working along these lines.

Perhaps one of the most encouraging characteristics of the meetings was their underlying optimism and the fact that this optimism seemed to be based largely on a realization of what science has done and is doing for the advancement of agriculture and country life. Dr. C. J. Galpin of the U. S. D. A. Bureau of Agricultural Economics made it plain in his Ten Year Review of Progress, that this benefit has not been merely in the discovery and introduction of improved methods and appliances, but has been manifested in the steady and persistent growth of the scientific attitude "incorporated in unmeasured but portentous degree in the minds and action of farm men and women." As Dean Mann expressed it in his summary, "the scientific principles governing the occupation of farming have come to be the possession of the rank and file of farmers," and "while the scientific habit of mind, both in farmers and in workers in agricultural science, still largely concerns itself with the technical operations of farms and homes, the significant fact is that it is germinal; planted in one department or organ, it steadily spreads to infect the whole being. With its natural growth it will become operative in all departments of living, economic and social, material and human. . . . It will sooner or later be in full operation among all the human relationships of rural society."

If this be so, then, as he put it, "one of our great resources is more fully to utilize the means at our disposal, and to improve those means, for ascertaining the facts which, in sequence, will enable us to go about producing the antecedents of good conditions and eliminating the antecedents of bad conditions. Tangible results of this process are now here and are inherent in farm practices, household methods, community institutions, and activities. What is now in its initial stages will in its ultimate reaches be of controlling importance alike in rural occupations and rural human relationships. The science of agriculture will become the science of rural society inclusively. As we believe that controllable facts make rural society what it is, so we believe that ascertainable facts will go far toward making farming and rural society what they must inevitably become if farmers are to share equitably in the satisfactions of life and the privileges and opportunities of a democratic social order."

It may well be that one of the outstanding results of the Michigan meetings will be the promotion of this state of mind. If so, it will be well worth while. It will constitute a most effective justification of research in these directions.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Changes in the composition of protoplasmic tissue by partial starvation, A. G. HOGAN, W. S. RITCHIE, and J. E. HUNTER (*Missouri Sta. Bul. 244 (1926), pp. 19, 20*).—The following data on lean loin beef are reported:

Composition of loin samples from yearling and 8-year-old steers

Constituent	From samples taken 1 hour after slaughtering		From samples taken after cooling for 12 days	
	Yearling steer	8-year-old steer	Yearling steer	8-year-old steer
	Per cent	*Per cent*	*Per cent*	*Per cent*
Total nitrogen in sample	3.126	2.685	2.158	2.718
Total nitrogen extracted by 10 per cent NaCl	2.256	1.631	1.062	1.290
Total nitrogen extracted in percentage of total nitrogen	72.66	60.74	33.63	47.46
Globulin precipitated by NaCl [1]	54.74	59.93	45.86	48.99
Albumin by heating filtrate and adding CCl_3COOH	26.19	20.88	28.37	28.08
Nonprotein nitrogen	19.78	14.82	35.12	26.74
Globulin by Li_2SO_4	77.90	71.44	56.40	59.03
Albumin by heat + CCl_3COOH	8.52	10.86	12.92	17.78
Nonprotein nitrogen	16.70	15.53	32.90	24.19

[1] All figures below this line represent nitrogen in terms of the extracted nitrogen.

A universal method for converting fibroin, chitin, casein, and similar substances into the ropy-plastic state, and into the state of colloidal solution by means of concentrated aqueous solutions of readily soluble salts, capable of strong hydration, P. P. VON WEIMARN (*Jour. Textile Inst., 17 (1926), No. 12, pp. T642–T644, pl. 1*).—In a series of experiments with fibroin (silk wadding), chitin (from shells of sepia and of three varieties of lobsters), cellulose, casein, and keratin (as pure white woolen yarn), the author finds all these colloids capable of dispersion, with greatly varying degrees of difficulty, in strong aqueous solutions of readily soluble salts capable of strong hydration. The salts examined showed the following diminishing order of effectiveness: LiI, LiCNS, LiBr, LiCl, $Ca(CNS)_2$, CaI_2, $CaBr_2$, $CaCl_2$. Aqueous lithium thiocyanate dissolved silk fibroin at room temperature, and calcium chloride and calcium nitrate solutions produced 10 per cent solutions of silk wadding at 115° C. in from 5 to 10 minutes. These dispersions, especially those of fibroin, are precipitable by alcohol in a form capable of being drawn into fibers, a photomicrograph of such a fiber being reproduced with the paper. Keratin (woolen yarn) was dissolved, after passing through a jellied, plastic state, by lithium thiocyanate at 170 to 200°. The procedure is believed applicable to "any dispersoid which yields soluble compounds through hydrolysis." The possible importance of these observations to artificial filament industries is noted.

The determination of moisture by the volatile solvent method, J. M. Jones and T. McLachlan (*Analyst, 52 (1927), No. 616, pp. 383–387, figs. 5*).—As a result of a critical study of the immiscible solvent method, the authors conclude that the distillation must be continued till no further water is distilled from the product; that toluene is usually the most satisfactory immiscible solvent; that all water of hydration is removed even when benzene is used as the immiscible solvent, and that this fact must be considered in calculating results; that the method is satisfactory for emulsions, including butter and margarine and oils, and is far more rapid than ordinary water or air oven methods; and that the method appears to give more consistent results than any other at present known for such substances as jam, honey, and malt extract, but that it can not be stated whether or not the results with such products are strictly accurate. For powders and other substances which do not cake together, water and air oven methods are considered quicker and preferable.

The determination of soluble iodides, J. F. Spencer and M. L. Smith (*Analyst, 52 (1927), No. 614, pp. 270, 271*).—The use of hydrochloric acid in Ditz and Margosches' method for the determination of soluble iodides[1] is considered dangerous on account of the formation of iodine chloride if the hydrochloric acid is allowed to become but slightly too concentrated, and yields high results in a titration with thiosulfate. The addition of calcium carbonate to drive out the iodine formed on adding potassium iodide was found unnecessary, since the liberated iodine can be boiled out in 10 minutes without the carbonate as against 7 minutes in the presence of the carbonate. Replacing the hydrochloric acid with acetic acid gave low results, but phosphoric acid was found quite satisfactory. An example in which theoretical accuracy was obtained by the use of phosphoric acid is given.

Isolation and identification of some organic nitrogenous compounds occurring in etiolated corn seedlings, S. L. Jodidi (*Jour. Agr. Research [U. S.], 34 (1927), No. 7, pp. 649–656*).—After it had been shown in a previous paper (E. S. R., 54, p. 724) that a great part of the protein of the maize kernel is converted into amino acids, polypeptides, and other degradation products by the process of germination, the present investigation was undertaken to find out the exact nature of the individual cleavage products.

This work, as detailed, is claimed to show that asparagine occurs in etiolated corn seedlings, that it has been isolated and identified by its chemical reactions, by its specific rotatory power and its formol titration, and by its water and nitrogen estimation. The occurrence of vernine in etiolated corn seedlings seems to be indicated. A few preliminary data are given on what appears to be an orange-yellow pigment met with in etiolated corn seedlings.

On the presence and detection of furfural in vinegar, L. H. Lampitt, E. B. Hughes, and L. H. Trace (*Analyst, 52 (1927), No. 614, pp. 260–265*).—Furfural is shown to be formed by the distillation of vinegars. This source of error is avoided by a method involving the extraction with an immiscible solvent of the color formed by the reaction of furfural with aniline acetate, the following procedure being recommended:

"Dissolve 6 ml. of redistilled aniline in 24 ml. of glacial acetic acid and make up to 60 ml. with pure amyl alcohol. (These reagents are completely miscible.) Add 10 ml. of this mixture to 20 ml. of the vinegar or other product to be examined, shake thoroughly, and then allow the mixture to stand in the dark for 15 minutes. Under these conditions the amyl alcohol separates as a distinct layer, colored deep red if furfural is present. This test is capable of detecting 0.1 part of furfural in a million parts of very dark colored vinegar."

[1] Chem. Ztg., 28 (1904), No. 99, pp. 1191–1194.

For distilled or pale colored vinegars it is considered sufficient to use the method of Youngburg and Pucher (E. S. R., 52, p. 804). The accuracy of the method is indicated by a series of analyses of a dark vinegar to which were added 0.5 to 5 parts per million of furfural. The largest error was in the case of 2.5 parts per million, when 2.75 parts were found.

A study of the determination of saccharin, colorimetrically and by the ammonia process, A. F. Lerrigo and A. L. Williams (*Analyst, 52 (1927), No. 616, pp. 377–383*).—The principal color reactions of saccharin were found unsuitable for quantitative determinations. The conversion into ammonia by acid hydrolysis was found adaptable to the accurate determination of small quantities of saccharin, however, the error indicated by the figures reported being from 0.05 to 0.1 of such small total contents as from about 0.02 to 0.05 per cent of samples of both liquid and solid food products. The method is as follows:

"The ethereal extract of the acidified sample is evaporated in a 100 cc. flask and weighed. A quantity of pure saccharin rather less than the weight of the ethereal extract is weighed into a 100 cc. flask, and 25 cc. of approximately 3 N hydrochloric acid are added to each. The flasks are covered by watch glasses and placed on the steam bath for 2 hours. After cooling, the solutions are made alkaline to litmus paper by the addition of approximately 3 N sodium hydroxide solution and made up to 100 cc. Aliquot parts of these two solutions are then nesslerized. A quantity equivalent to between 0.5 and 1 mg. of saccharin was found . . . convenient."

The determination of sulphur dioxide in dried fruit, P. May (*Analyst, 52 (1927), No. 614, pp. 271–273*).—Hydrochloric acid was found to be more accurate than phosphoric acid for releasing the sulfur dioxide in the well-known method of distillation into bromine water. The following method is given as very satisfactory:

"The weighed quantity of fruit is placed in a round-bottomed flask of about 500 cc. capacity, containing 25 gm. of marble, and connected, by means of a splash head, with a condenser fitted with an adapter dipping into 100 cc. of saturated bromine water. Twenty-five cc. of concentrated hydrochloric diluted to 300 cc. with recently boiled distilled water are then run into a flask from a tap funnel, and the apparatus left at room temperature until the evolution of carbon dioxide has slackened. The flask is then heated very gently until all the carbon dioxide has been evolved, and the flame then increased so as to keep as steady a distillation as possible until about 200 cc. have distilled over. If the bromine should become decolorized more bromine water should be added, but 100 cc. are usually sufficient. The distillate is then evaporated down to about 120 cc., and the barium sulfate precipitated and weighed with the usual precautions."

Various possible sources both of high and of low results are discussed, the conclusion being that low results are far more probable.

Irish moss mucilage and a method for its determination, P. Haas and B. Russell-Wells (*Analyst, 52 (1927), No. 614, pp. 265–269*).—Carrageen mucilage, either hot- or cold-water soluble, consists of organo-calcium sulfates precipitable by benzidine chloride, which quantitatively removes carbohydrate from solutions of these gums. Agar, gum arabic, and orange and apple pectins gave no precipitates. The test is therefore considered probably specific for carrageen mucilage in jams, jellies, adhesives, etc. The factors for calculating the hot- and cold-water soluble carrageen mucilages from the titration figures are so similar that the error arising from the use of an average factor is inappreciable. The method is as follows:

"A quantity of the solution containing approximately 0.2 gm. of dry extract is either measured or weighed out, according to the viscosity of the fluid. The solution is then diluted to about 100 cc., acidified with 4 drops of 4 N hydrochloric acid, and precipitated with 150 cc. of benzidine chloride solution containing 4 gm. of benzidine and 5 cc. of concentrated hydrochloric acid in 2 liters. The mixture is allowed to stand for at least 20 minutes, and the flocculent precipitate is then filtered off through a fluted filter paper, and washed free from chloride with a saturated solution of benzidine sulfate. The precipitate and filter paper are put into a beaker, covered with about 250 cc. of water, heated on a water bath to 80° C., and titrated with 0.1 N sodium hydroxide solution in presence of phenolphthalein. The amount of mucilage is calculated on the basis that 1 cc. of 0.1 N sodium hydroxide solution corresponds to 0.0024 gm. of mucilage."

A rapid and accurate means of estimating nicotine in tobacco and tobacco extracts, R. R. L. Worsley (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 73 (1927), pp. 5*).—For the accurate determination of nicotine in warm climates ether is too volatile. Petroleum ether of a boiling point range of from 50 to 60° C. or higher was found to give accurate results. Any ammonia present was best removed by drawing a stream of air through the solvent prior to titration. The fixation of the ammonia by means of gypsum was found useless except in the case of very small quantities of ammonia. The following method is given:

Pipette carefully 100 cc. of nicotine sulfate solution into a 400 cc. bottle having a well-fitting stopper, add 20 to 25 cc. of 20 per cent caustic soda, and further add exactly 100 cc. of petroleum ether. Shake the mixture well for from 10 to 15 minutes and allow it to settle for 10 minutes, after which decant off 40 cc. and pour into 50 cc. of distilled water. Do not filter the extract, as this is unnecessary and causes loss of solvent by evaporation. Add an excess (about 5 cc.) of exactly N/10 sulfuric acid, shake the mixture gently for a minute, and titrate back with exactly N/100 caustic soda. Should the end point be passed, add 5 cc. of exactly N/100 normal sulfuric acid and continue the titration. This frequently gives a better end point, as the solvent tends to retain a little of the nicotine.

SOILS—FERTILIZERS

A classified list of soil publications of the United States and Canad (*U. S. Dept. Agr., Library, Bibliog. Contrib. 13 (1927), pp. XI+549*).—This i an inclusive rather than a selective bibliography, prepared mainly by M. F Warner. It contains a very large number of references to the literature o soils, together with a comprehensive subject index, and is divided into th following classes: General, soil classification and nomenclature, soil geograph soil chemistry, soil physics and mechanics, soil biology and biochemistry, soi ecology, soil fertility, soil management, and fertilizers. The publication appear in mimeographed form.

Soils of Phillips County, L. F. Gieseker (*Montana Sta. Bul. 199 (1926 pp. 61, pls. 4, fig. 1*).—A reconnaissance survey, made in cooperation with th U. S. D. A. Bureau of Soils, of an area of 5,266 square miles in the northeaster part of Montana is reported. The county consists of rolling to sharply rollin country, rough broken land, and bad lands, 57.3 per cent of the total are being stated to be nonagricultural according to the U. S. Department of Interi map. Drainage is provided by the Milk River and the Missouri River ar their tributaries. Artificial drainage is needed in a few places.

The soils of this area are mapped and described in 12 series of 15 types, 28 per cent of the total area being covered by Scobey loam, 18 per cent by Phillips loam, and a little less than 10 per cent by Pierre clay loam.

Soil survey of Polk County, North Carolina, W. D. LEE and S. F. DAVIDSON (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+331–356, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Experiment Station, deals with an area of 151,680 acres in southwestern North Carolina, the Piedmont Plateau occupying about three-fourths of the area, while the remainder is Appalachian Mountain Plateau. The elevation varies from about 700 ft. to somewhat more than 2,000 ft., with two peaks exceeding 3,000 ft. The drainage is in general good to excessive in all parts of the county with the exception of lower stream bottoms, which are for the most part fairly well drained.

The soils of this area have been mapped as 9 series of 14 types, Cecil clay loam and Cecil sandy clay loam covering, respectively, 46.4 and 12.6 per cent. The survey includes rough stony land, 8.3 per cent, and meadow (Congaree material), 1.3 per cent, unclassified.

[Soil studies at the Missouri Station] (*Missouri Sta. Bul. 244 (1926), pp. 51–58, figs. 6*).—Continuing previous work (E. S. R., 54, p. 715) in soil erosion studies by M. F. Miller and H. H. Krusekopf the loss of soil from corn plats was found far greater than that from clover plats. The soy bean plats showed little erosion while the crop was on the land, but the erosion was more destructive after the crop had been removed, resembling that of the other cultivated plats. In experiments on the improvement of eroded soils, acid phosphate, lime, and sodium nitrate gave a hay yield of 2,671 lbs. in two cuttings where surface soil had been removed. With the surface soil removed and without the fertilizer treatment the yield was 406 lbs.; and with the surface soil in place and without treatment the yield was 3,809 lbs.

In fertilizer experiments on the more important soil types in Missouri, phosphate, potash, and lime increased the 1925 yield of corn and wheat by 16.62 and 12.18 bu. per acre. For wheat the phosphate and lime treatment averaged 2.5 bu. higher per acre than did the manure treatment. On Ozark pasture lands, acid phosphate was found superior to other treatments, including manure.

An investigation of the character of the colloids of Missouri clay soils is reported by R. Bradfield. It was found that by electrodialysis in a three-compartment cell, equipped with parchment membranes, a dialyzate was obtained in which from 70 to 97 per cent of the total bases were calcium and magnesium. Muck soils were found almost completely lacking in dialysable potassium. The amount of the electrodialysable anions was in general less than 5 per cent of the amount of the cations removed. A colloidal clay from Putnam silt loam subsoil from which all dialysable acids and bases had been removed formed a stable sol of pH value of 3.4 and a titrable acidity of 74 milliequivalents per 100 gm. of oven-dry colloid. A clay leached for several weeks with N/100 hydrochloric acid and then with water until free from chlorides gave very similar results. These and other experiments with soils, some pure minerals, and a permutit of high exchange capacity, indicated almost identical results for the neutral salt base exchange method and the electrodialysis method.

Analyses, by Miller and Krusekopf, of the first 7 in. of soil from plats under continuous clover left on the ground, continuous bluegrass clipped and left on the ground, and continuous alfalfa cut and removed, showed slight increases in the nitrogen content. Other plats, particularly continuous rye, and the corn, wheat, clover rotation had lost nitrogen appreciably, even when manured. Taking the subsurface soil from 7 to 12 in. into consideration, all

the plats lost nitrogen under every system, the loss being largest under continuous rye plowed in and least under continuous sod.

A fertilizer experiment on corn is reported, in which a 2-year system of corn and a small grain, followed by sweet clover turned under in the spring for the corn when planted on land quite low in organic matter and nitrogen gave average yields for all plats, both fertilized and unfertilized, of 58.2 bu. per acre, the average for the 8 preceding years having been but 28.37 bu. When a sweet clover crop carrying over 100 lbs. of nitrogen was turned under, nitrogen ceased to be the most important limiting element, and phosphatic fertilizer gave a large increase.

In experiments on the necessary fineness of grinding limestone, the lime requirement was determined on a series of small plats treated with 10-mesh ground limestone 10 years before, some to neutrality or beyond in the surface 8 in., others to neutrality in the subsoil 8 to 18 in., while still others had both layers neutralized, and the check plats were left unlimed. All layers were found acid except the more heavily limed surface soils. The subsoil from 8 to 18 in. in all the limed plats showed approximately the same acidity as the untreated plat.

In tests by W. A. Albrecht on the longevity of *Bacillus radicicola*, the legume bacteria were found no longer living in the dry soils after five or more years. Soils left out of doors produced nodules. The tabulated data of this experiment are presented. Greater longevity in the red clover organism than in the soy bean organism is suggested.

In a study of ammonia and nitrate production, liming was found to augment nitrate accumulation markedly in plats under a rotation of corn, oats, and wheat, clover, timothy, and timothy, when no treatment was given, but not so markedly in the plat receiving manure and phosphate. Green manure alone or limestone alone was less useful for nitrate accumulation. General nitrogen accumulation activities were at a higher level when manure and phosphates were used than when no treatment was applied.

[Soil studies at the Porto Rico Station], J. O. Carrero and H. C. Henricksen (*Porto Rico Sta. Rpt. 1925, pp. 5, 6, 7–11*).—The results of the following investigations are reported:

Management of cane soils.—Experimental treatments of soils for sugar cane culture fertilized annually with nitrogen are briefly reported, the results being tabulated as follows:

Comparative yield of second-plant cane plats under different treatments

Plat series	Trash burned			Trash plowed under		
	No legume	Legume plowed under	No legume	Legume plowed under	No legume	Legume plowed under
Limed:	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
A	32.664	36.832	30.200	32.480	29.600	[1]33.18
C	48.520	49.320	49.083	51.861	44.565	[2]45.88
E	47.106	47.840	47.311	48.860	44.620	45.33
Unlimed:						
B	33.100	38.960	35.609	38.080	38.810	[3]39.27
D	48.110	50.224	48.710	51.600	44.180	[3]46.00
F	46.063	48.000	46.416	47.200	42.360	[3]44.[illegible]

[1] No nitrogen. [2] Nitrogen as $NaNO_3$. [3] Nitrogen as $(NH_4)_2SO_4$.

Effect of sulfur and sulfur compounds on soils.—Sulfur as such gave only insignificant gains, but when applied as sulfates showed considerable gain over both untreated and sulfur-treated pots. Significant gains resulted only when the sulfur was accompanied by phosphorus, but the increase was smaller than when phosphorus alone was used.

Soil moisture.—In experiments to determine the capacity of a soil to provide the necessary moisture for pineapple plants, well-baked brick clay cylinders, 1 in. in diameter and slightly more than 5 in. in length, were shellacked on the ends, leaving an absorbing surface of 16 sq. in. These were weighed dry and buried about 6 in. deep in the soil, 1 ft. apart. The average gain in weight of all the cylinders was then determined. It was concluded that a soil delivering an average of 5 gm. of water each 24 hours to each cylinder can be depended upon to supply the necessary 20 to 40 gm. of water to a well-rooted pineapple plant in the same length of time. The experiments with these soil points indicated excess moisture content as a more frequent problem than deficiency in moisture.

Soil aeration, soil reaction, the improvement of unsuitable soils, the use of sulfur, and general fertilizing problems as applied to pineapple culture in Porto Rico were also studied. It is concluded that a soil may be said to be suitable when its pH value is below 6 and its solution settles quickly. Sulfur appeared to be beneficial, and tests of soil samples from many pineapple fields showed that nitrogen and potash were needed in large quantities.

[Soil fertility studies at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1926, pp. 35–40, 43, 44*).—Experiments on soil organic matter are reported, in which corn grown continuously with complete fertilizer yielded as a 7-year average 49 bu. per acre with 20 lbs. of nitrogen per acre per year and with a legume cover crop plowed in, 50 bu. per acre with 60 lbs. of nitrogen and a rye cover crop plowed in, and 44 bu. with 60 lbs. of nitrogen without cover crop. As an 8-year average, the above ground dry matter yielded by Japanese millet, corn, pearl millet, sunflower, barley, buckwheat, and Sudan grass was 1.68, 1.38, 1.35, 1.35, 1.34, 1.14, and 1.06 tons per acre. Rotation and fertilizer tests are also reported with various vegetables.

In experiments on the comparative efficiency of fertilizers and manures, 4 cords of horse manure yielded 2.94 tons of hay per acre; 50 lbs. of nitrogen as nitrate of soda, 3.13; 25 lbs. of nitrogen as nitrate of soda, 2.72; 25 lbs. of nitrogen as cyanamide, 2.49; and 25 lbs. of nitrogen as sulfate of ammonia, 2.48 tons. On plats neutralized by liming, chlorotic crops were found to recover when sprinkled with manganous chloride or sulfate. Thirty lbs. of manganous sulfate per acre added in fertilizer was found beneficial, but a further sprinkling with from 8 to 15 lbs. diluted with 1,000 parts of water was also needed. Oats, millet, spinach, beets, lettuce, and corn were increased markedly by the addition of manganese, the onions being increased fivefold.

The addition in 1925 of high-calcium or high-magnesium hydrate or carbonate liming materials equivalent to 3,000 lbs. of calcium oxide produced alkaline soil in 1926, with a manganese deficient chlorosis of the crops. The crops were normal only when the lime and manganese were added. The color was normal, but the yield was low where lime had not been added. Aluminum salts in solution were found toxic to lettuce, beets, timothy, and barley. Radishes, sorghum, cabbage, oats, and rye were moderately sensitive, and corn, turnips, and redtop were found relatively resistant to aluminum injury. Large amounts of acid phosphate were useful in modifying the soil for low resistance crops.

Lawn or putting green grass plats were maintained in an acid condition by annual early spring application of 250 lbs. each of sulfate of ammonia, acid

phosphate, and muriate of potash per acre, with a resulting suppression of plantain, dandelion, chickweed, and crabgrass.

The recovery of soil nitrogen under various conditions as measured by lysimeters of different depths, C. A. MOOERS, W. H. MACINTIRE, and J. B. YOUNG (*Tennessee Sta. Bul. 138 (1927), pp. 30, figs. 10*).—Experiments on Hagerstown loam, Cumberland clay loam, and Memphis silt loam in cylinders of 1, 2, 4, and 6 ft. depths are reported, and the lysimeter apparatus used is described. The surface soil was of a depth of 1 ft. in all the tanks, the remainder of the space in the 2, 4, and 6 ft. tanks being occupied with a subsoil. Experiments were made without cropping and with cropping to oats, wheat, alfalfa, tall oat grass, and millet. The crop yields were in general in proportion to the amount of subsoil. The general conclusion was reached that in the study of income and outgo of nitrogen from the surface soil, subsoil interferes to a serious extent by delaying the outgo, which may be so retarded as to be practically unrecoverable.

The effect of applications of cyanamid on the nitrate content of field soils, F. E. ALLISON (*Jour. Agr. Research [U. S.], 34 (1927), No. 7, pp. 657–662*).—Cyanamid was found to retard nitrification markedly in soil samples taken from a field under cotton. This crop had a smaller nitrate supply available when fertilized with cyanamid than did the cotton on the control plats. Injurious decomposition products of cyanamid are also believed to play a part in the unsatisfactory results, some of these injurious substances being direct plant poisons, while others poison only the nitrifying bacteria.

A preliminary report on the value of hairy vetch and crimson clover for green manure, R. P. BLEDSOE (*Georgia Sta. Bul. 146 (1927), pp. 187–208*).—The preliminary experiments carried on in 1925 and here reported indicate in part (1) that vetch can be turned under much earlier than was formerly believed profitable; (2) that the vetch yields increased with the rate of seeding, but not in proportion to the increased amount of seed, and that from 20 to 30 lbs. per acre was best; (3) that there was little difference between the effect of acid phosphate and of rock phosphate upon vetch, both giving good yields, while in the plats receiving no phosphate the yields were poor; (4) that potash is apparently not needed for vetch on Cecil clay loam; and (5) that, as judged from the yields and analyses reported of bur clover, subterranean clover, Tifton bur clover, and Austrian winter peas, all these legumes are valuable green manures.

Comparative value of sheep and horse manure, J. S. CUTLER and S. C. HARTMAN (*Ohio Sta. Bimo. Bul., 12 (1927), No 3, pp. 85, 86*).—Applied on a rotation plat during 12 years, 2 tons of sheep manure and 400 lbs. of 16 per cent acid phosphate per acre on the corn and wheat crops yielded 16.49 bu. of corn, 605 lbs. of soy bean hay, 13.20 bu. of wheat, and 1,128 lbs. of mixed hay, while 4 tons of horse manure and 400 lbs. of acid phosphate applied both to the corn and the wheat yielded 14.64 bu. of corn, 627 lbs. of soy bean hay, 13.09 bu. of wheat, and 1,643 lbs. of mixed hay. Similar conclusions were drawn from chemical analyses of the two fertilizers, namely, that the horse manure is only about one-half as effective as the sheep manure.

AGRICULTURAL BOTANY

Studies in the physiology of plants, R. STOPPEL (*Pflanzen-physiologische Studien. Jena: Gustav Fischer, 1926, pp. [5]+165*).—While recognizing the generalized character of many or most of the physiological characters or processes dealt with, the treatment in this little volume is concerned mainly with plants, including respiration, fermentation, narcosis, sensibilization and photodynamics, chlorophyll, carbon dioxide assimilation, transpiration, water uptake

and transfer, growth, geotropism, phototropism, light relations, conduction of stimulation, and periodical phenomena.

Textbook of plant physiology.—I, Chemical physiology, S. KOSTYTSCHEW (*Lehrbuch der Pflanzenphysiologie.—I, Chemische Physiologie. Berlin: Julius Springer, 1926, vol. 1, pp. VII+567, figs. 44*).—This first volume deals systematically with general chemical physiology, the several chapters presenting, in analytical detail, the fundamentals of chemical plant physiology; the uptake of energy by green plants and the primary synthesis of organic materials; chemical synthesis and assimilation of molecular nitrogen; the feeding of the plant with prepared organic compounds; the process of supplying the plant with ash materials and its significance; carbohydrate and nitrogenous bodies and the metamorphosis of these materials in plants; secondary plant materials; and respiration and fermentation.

Root development of field crops, J. E. WEAVER (*New York and London: McGraw-Hill Book Co., 1926, pp. XII+291, figs. 116*).—The author has sought to bring together in this volume the more important results of his own work, alone or with others, also those of related studies by others, so as to present, as far as possible, a general view of the root development of crops in the United States, but not elsewhere, though literature on recent foreign investigations is indicated.

The materials used for this publication have been in part drawn from publications of the Carnegie Institution of Washington, specifically, Nos. 286, 292, 316, and 357 (E. S. R., 44, p. 220; 45, p. 732; 48, p. 25; 54, p. 130). The bibliography includes 232 titles.

Theoretical considerations regarding cell stimulation [trans. title], M. POPOFF (*Zellstimulationsforsch., 2 (1926), No. 2, pp. 105–111*).—On increase of the stimulating agency in water, as much as 80 per cent additional water may be bound. This fact is thought to be of biological significance in ways which are outlined, with discussion.

Cell stimulation and its explanation [trans. title], ST. KONSULOFF (*Zellstimulationsforsch., 2 (1926), No. 2, pp. 113–130*).—Besides experimental data, a general discussion presents broadly but briefly the various phases of cell stimulation and its bearings.

The influence of pretreatment of seed on growth and stimulation phenomena in seedlings [trans. title], G. FRIESEN (*Jahrb. Wiss. Bot., 65 (1925), No. 1, pp. 28–60, figs. 15*).—In tests on the effects of pretreatment employed with seed grain of oats and maize, as stimulating agents, heat and sulfur dioxide gave varying results which are detailed.

External factors influencing germination in grape seeds [trans. title], A. ZIEGLER (*Zellstimulationsforsch., 2 (1926), No. 2, pp. 161–170, fig. 1*).—The stimulating influence on grape seed germination of commercial germicides, of several poisons in very dilute solutions, of Röntgen ray irradiation, and of several salts are detailed.

Stimulation studies on seed of Sinapis alba [trans. title], C. ABELE (*Zellstimulationsforsch., 2 (1927), No. 3, pp. 277–284, figs. 6*).—In this work, dealing principally with the stimulation of germination, the idea of favorable effects from stimulation appears to be substantially supported by secondary considerations which are connected with stimulation.

Stimulation studies on spinach [trans. title], J. GRAF WALLWITZ and GRÄFIN WALLWITZ (*Zellstimulationsforsch., 2 (1926), No. 2, pp. 171–175, figs. 2*).—The authors have studied in a preliminary way, and herein present in graphic and descriptive detail, data as to the stimulating effects on germination of spinach seed caused by 1 and 5 per cent sodium bromide.

Relations between amount and results of stimulation [trans. title], L. Brauner (*Jahrb. Wiss. Bot., 64 (1925), No. 5, pp. 770–821, figs. 19*).—Plantlets of the sensitive bean (*Phaseolus multiflorus*) germinated in sawdust and grown in flowerpots under controlled conditions are said to have shown a pendulum-like action and reaction due to stimulation by light. The character and relations of these responses are discussed.

The effect of solutions of eosin, erythrosin, and methylene blue on germination and growth of some plants [trans. title], J. C. van der M. Mohr (*Rec. Trav. Bot. Néerland., 23 (1926), No. 1-2, pp. 245–262, figs. 12*).—The germination and further development of rice, maize, wheat, soy beans, Arachis, cassava, and sugar cane are influenced by 0.5 per cent solutions of eosin and erythrosin in ways which are particularized.

Forcing experiments with hydrocyanic acid [trans. title], G. Gassner (*Zellstimulationsforsch., 2 (1926), No. 1, pp. 1–46, figs. 16*).—A detailed study is presented of the effects and practicability of using hydrocyanic acid as a forcing treatment, dealing in all with 30 species of plants in 26 genera of 12 families.

The behavior of crucifer seedlings in connection with copper salts [trans. title], W. Munkelt (*Zellstimulationsforsch., 2 (1927), No. 3, pp. 285–290*).—This is a study bearing upon the problem as to the relations between fungicidal treatments and stimulation effects.

The iron requirement of rice plants [trans. title], O. Richter (*Sitzber. Akad. Wiss. Wien, Math. Naturw. Kl., 135 (1926), I, No. 5-6, pp. 203–242, pl. 1*).—Plantlets of rice (*Oryza sativa*) show, in media deficient in iron, a severe chlorosis, which can be prevented or relieved by addition of iron sulfate.

The influence of sodium chloride on the development of tomatoes [trans. title], F. D. Likhonos (*Priroda i Selsk. Khoz. Zasushl. Pustyn. Oblas toi SSSR (Nature and Agr. in Arid Regions U. S. S. R.), No. 1-2 (1926), pp. 66–71*).—Experimentation testing the effects of sodium chloride (0.5 to 1.0 per cent solution) on the growth of tomatoes showed that with soils rich in organic matter 0.5 per cent sodium chloride exerts a stimulating influence. The transpiration coefficient was low, while the transpiration itself was high. With 1 per cent sodium chloride the dry matter formed was lower, and the transpiration coefficient much lower, than in case of the untreated plants.

The salt requirement of tobacco grown in sand cultures, H. Liu (*Maryland Sta. Bul. 288 (1926), pp. 132–153, figs. 8*).—The effects of various nutrient salts on the yield, chemical composition, and physical properties of tobacco were studied in sand cultures, using some solutions of type I of the three salt solutions recommended by the division of biology and agriculture of the National Research Council (E. S. R., 44, p. 130).

Dry weight was increased with high concentrations of calcium nitrate, but decreased with high concentrations of magnesium sulfate. Nicotine was high when calcium nitrate was high, but not in direct ratio. High potassium dihydrogen phosphate also favored nicotine synthesis. High calcium nitrate decreased plant ash, producing a loose, white ash. Magnesium sulfate increased the ash and improved its firmness. High nitrate produced rough leaves of dark color and poor burning quality. The presence of available potash and the absence of chlorine appear essential to good burning quality. Leaves grown in solutions high in calcium nitrate but practically free from chlorine burned in flames.

No particular solution indicated a fertilizer for tobacco, as none of those tried supported the tobacco to maturity. Physiological injuries appeared in all cultures. "Sand-drown" bleaching occurred in all six duplicate plants of the culture which had the least magnesium sulfate. Blackening of the leaf stem

in the leaf just emerging from the bud and subsequent killing of the terminal bud occurred in plants of all cultures. The injury occurred earlier when the calcium nitrate was high. Histological studies of the injury showed several symptoms characteristic of that due to nitrogen excess.

Relation of hydrogen-ion concentration to the growth of plants, W. J. ROBBINS (*Missouri Sta. Bul. 244 (1926), p. 30*).—Studies, earlier phases of which have been noted (E. S. R., 54, p. 743; 56, p. 424), are reported. The ash of potato tuber disks which had been immersed in dilute sodium phosphate buffer mixtures showed, in general, but little ash loss in solution of pH 7.0 to 8.0, some loss at 6.0 to 7.0, more at 4.5 to 6.0, and rapid loss beyond pH 4.5. Death of potato tuber tissue in dilute sodium phosphate solutions more acid than pH 4.5 is delayed by addition of small quantities of calcium salts. A loss of ash elements may be lessened by very small additions of calcium.

Elodea leaves (detached) in sodium phosphate buffer mixtures containing 0.03 N sodium and varying from pH 4.8 to 7.2 remained alive for more than a week, and gradually became yellow, the chloroplasts shrinking and developing a golden yellow color. Changes in acid and basic dyes are noted. "Cultures on liquid and solid media containing uniform concentrations of toxic acid or basic dyes but differing in H-ion concentration show that the toxicity of the acid dyes is markedly increased for *Rhizopus nigricans* in solutions acid to about pH 5.0; for *Gibberella saubinetii* in solutions acid to about pH 6.4. The basic dyes are decidedly more toxic in solutions alkaline to these points. *Fusarium oxysporum* responds much like *G. saubinetii*. These results are correlated with the isoelectric points previously reported for the first two organisms but not with that found for the third."

Effect of certain nutrient conditions on activity of oxidase and catalase, B. D. EZELL and J. W. CRIST (*Michigan Sta. Tech. Bul. 78 (1927), pp. 24, figs. 3*).—These investigations employed healthy herbaceous plants (lettuce, radish, and spinach) grown under widely varying conditions as regards nutrition and environment, testing the effects of certain nutrient conditions of the soil as regards activity of oxidase and catalase and the relation of this effect to growth.

Correlation between oxidase activity and growth or size of the plants was slight to negative. Correlation between the activity of catalase and growth or size of the plants was better than with oxidase and significantly negative.

"Since the soil treatments (liming included) consistently and significantly affected the growth and size of the plants, they were antecedent to, not to say causal in, the decrease of oxidase and catalase activity when accelerating growth and to increased activity of these enzymes when growth was retarded by their presence."

Nitrate assimilation in higher plants, I [trans. title], G. KLEIN and J. KISSER (*Sitzber. Akad. Wiss. Wien, Math. Naturw. Kl., 134 (1925), I, No. 3-4, pp. 101-120, fig. 1*).—The authors present briefly, for this first study, the physical, chemical, and culture methods employed, also tabular and other data obtained with cereals and legumes, and some conclusions regarding chiefly the utilization, but also in part the production or exchange, of ions containing nitrogen.

Albumin formation in animal and plant [trans. title], E. KOMM (*Naturw. u. Landw. [Freising], No. 5 (1925), pp. 62*).—An account, largely chemical and bibliographical, is given of the formation of albumin in plants and some of its relations to animal life.

Photo-electric measurements of illumination in relation to plant distribution, Part I, W. R. G. ATKINS and H. H. POOLE (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 25, pp. 277-298, fig. 1*).—Measurements have been made of illumination in the shade and in the open by means of apparatus indi-

cated. The most satisfactory way of expressing the illumination at a shaded site, in relation to its flora, is as a percentage of the diffuse light in the open, this percentage being here termed the daylight factor. Data are presented concerning the distribution of various plants in terms of the daylight factor. This factor may be as low as 1 to 2 per cent on the floor of a wood of mixed deciduous trees in autumn, and less than 0.06 per cent in especially heavy shade under rhododendron.

Some preliminary studies of the influence upon plants of the relative length of day and night, Y. Yoshii (*Tôhoku Imp. Univ., Sci. Rpts., 4 ser., 2 (1926), No. 2, pp. 143–157, pls. 4*).—In experiments with plants named, more particularly with rice but also with wheat, Indian millet, buckwheat, sunflower, cosmos, morning glory, eggplant, soy bean, and maize, the author found most of these plants to belong in the short-day class, flowering only when the day length falls within certain limits. There is, however, another group of plants which are nearly or totally indifferent as to photoperiod, being determined as to flowering time by other factors.

The growth rate tends to be proportional to the length of the daily exposure period. It is true the growth of a plant may be forced also by slight shading, but in this case the plant is apt to flower sparingly.

Early and late rice varieties respond to light regulation quite differently as to both time of flowering and rate of growth. The late variety is a short-day plant, the early variety being indifferent as to light period.

Photoperiodism is a critical factor for distinction as to varieties of certain plants.

Relation of situation to transpiration in shade plants and in sun plants [trans. title], M. Dietrich (*Jahrb. Wiss. Bot., 65 (1925), No. 1, pp. 98–194, figs. 13*).—A study of relations between location and transpiration in connection with shade plants (about 15 genera, 160 examples) and with sun plants (about 12 genera, 68 examples) shows a general correspondence, as regards variation, between transpiration and external conditions. Particulars are detailed in conclusions.

Transpirational rhythm in Festuca sulcata [trans. title], E. I. Proskoriakov (*Priroda i Selsk. Khoz. Zasushl. Pustyn. Oblastei SSSR* (*Nature and Agr. in Arid Regions U. S. S. R.*), *No. 1–2 (1926), pp. 64, 65*).—Plants of *F. sulcata* were taken up with the soil from the steppe and transferred directly to zinc containers. The soil was then covered with cotton and watered from below, and the transpiration was measured in the usual manner. The results showed a rhythm in transpiration when there was a scarcity of water. Rhythmical transpiration was observed also at times even under optimal conditions of water supply.

On the rate of carbohydrate transport in the greater yam, Dioscorea alata Linn., T. G. Mason and C. J. Lewin (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 16, pp. 203–205, fig. 1*).—Observations by the authors on the movement of carbohydrates through the stem carrying the tubers of the greater yam (*D. alata*), near Ibadan, Southern Nigeria, lead to the conclusion that, even when high concentrations are present, the phloem appears incapable of transmitting carbohydrates. "That the phloem, in common with other living tissues, may transmit sugars at a limited rate is probably not in doubt, but that carbohydrates are normally transported through it seems impossible."

The relation between the specific conductivity and the structure of the wood elements in the tropical plants, R. S. Inamdar and A. L. Shrivastava (*Jour. Indian Bot. Soc., 4 (1925), No. 9–10, pp. 304–306; abs. in Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 186*).—Having found that the specific conductivity of the wood in tropical plants differs among species, among individuals,

and among branchlets of the same tree, and having noted some conclusions reached by others, the authors undertook a number of measurements of vessels in sections at different places on the plant and obtained an average figure for the diameter of the vessels in each species for comparison with the average specific conductivity. The results thus obtained are tabulated.

In general the diameter of the vessels varies in the same direction as the specific conductivity, which is correlated with the demands made by the transpiring leaves on the water supply. A characteristic difference is noted between a mature tree and a sapling, this difference being correlated with the smaller diameter of the vessels in the sapling. The diameter of the vessels is not the only contributing factor toward variations in the specific conductivity, as is illustrated by the fact that no quantitative proportionality is maintained between the diameter of the vessels on the one hand and the specific conductivity on the other. However, the results in general confirm the conclusions, based on observations in both temperate and tropical regions, that the main cause for variations in the specific conductivity is the resistance offered by the wood.

The plant and drought from the agricultural viewpoint [trans. title], B. A. KELLER (*Priroda i Selsk. Khoz. Zasushl. Pustyn. Oblastei SSSR* (*Nature and Agr. in Arid Regions U. S. S. R.*), *No. 1–2* (*1926*), *pp. 17–52*).—Dealing with problems of plants involving moisture supply in arid regions, the author reviews available information on such matters as transpiration, wilting, stomatal functioning, respiration, and root system adaptations, recording also experimentation at the Voronezh Experiment Station on wild plants growing in arid regions, and selection experiments.

The influence of temperature on the permeability of protoplasm in Beta vulgaris [trans. title], D. DE V. SMITS (*Rec. Trav. Bot. Néerland., 23* (*1926*), *No. 1–2, pp. 104–199, figs. 13*).—The author found that temperature changes affected the process of diffusion and really altered the cells.

The influence of low temperatures on plants [trans. title], T. M. ZACHAROWA (*Jahrb. Wiss. Bot., 65* (*1925*), *No. 1, pp. 61–87, figs. 5*).—Alterations following exposure to cooling of rye, wheat, pea, maize, and buckwheat roots can be presented graphically by a curve corresponding to that of temperature. Freezing temperature is not constant for one and the same root, as the attainment of freezing depends upon individual peculiarities and the range of temperatures employed.

The killing point of roots is lower than the freezing point. The lowest resistance is shown by the cortex and root hairs, the highest by the meristem, and the intermediate by the central cylinder.

A study of the vital reactions as regards root cells showed that buckwheat has the greatest acidity. A positive correlation was noted between cold resistance and alkaline reaction and a negative correlation between the acidity and resistance to cold, the central cylinder being approximately neutral. This correspondence between reaction and resistance to cold is thought to be of practical importance. Acid reaction may hasten the death of cells in freezing, and this is said to be evidenced by experiments with red cabbage sections. Even very weak acid concentrations correspond to a significant lowering of cold resistance in the cells. Weak alkaline concentrations, on the other hand, correspond to important increase of cold resistance. Precipitation of nitrogenous materials in acid media requires a smaller temperature decline and a slighter water removal than in alkaline media.

It is concluded that the disturbance of physicochemical equilibrium of the plasma in freezing must proceed much more rapidly in cells showing acid than in those showing alkaline reaction.

The physiological nature of the differences between summer and winter grains [trans. title], N. A. MAXIMOW and A. I. POJARKOVA (*Jahrb. Wiss. Bot., 64 (1925), No. 5, pp. 702–730, figs. 3*).—Studies on the physiological character of the differences between winter and summer forms of cereals are outlined as made with wheat seeded December 18, March 8, and April 16 and with rye seeded January 9, February 2, and March 6. The various results are discursively detailed.

The pentosan theory of cold-resistance applied to conifers, J. DOYLE and P. CLINCH (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 21, pp. 219–235, fig. 1*).—Attention is called to the lack of available knowledge concerning the physiology of evergreens, particularly conifers. The theory that cold resistance depends on pentosan content was examined by a seasonal study of conifer leaves.

The pentosans of conifers are placed in three groups, namely, water-soluble pentosans, pentosans subsequently extractable with 1 per cent hydrochloric acid, and pentosans extractable with hydrochloric acid not lower than 12 per cent. These classes vary considerably, though not independently, throughout the year, the variation in the first two classes being reciprocal. Cupressus is remarkable in having a very high winter content of water-soluble pentosan. Conifer leaves are distinctly acid, showing a pH value of 3 to 4 with very little seasonal variation. Cupressus is less acid than the other forms.

Analysis of the full results from the study of conifers showed no seasonal or other relations between hardiness and pentosan content.

The dehydration rates of conifer leaves in relation to pentosan content, J. DOYLE and P. CLINCH (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 24, pp. 265–275, figs. 4*).—Data presented as obtained from the drying of conifer leaves are believed to show that the claim made in a paper by Rosa (E. S. R., 46, p. 827), that the rate of dehydration of certain plant tissues at 60° C. decreases with increasing content of water-soluble pentosan, can not be substantiated. It is also claimed that mere rates of dehydration under uniform conditions may be no reliable index of hardiness. The dehydration of plant tissues is a complicated physical process which still requires to be analyzed.

The influence of Ustilago tritici on the respiration and evaporation of wheat [trans. title], A. L. KURSANOV (*Bolezni Rastenii, 15 (1926), No. 2, pp. 57–71, figs. 5*).—These respiration experiments employed both healthy and infected plants, beginning with the germination of the seeds. The determinations for the seeds were made on the basis of carbon dioxide given off in 24 hours per gram of seed dry weight. For the plants, the carbon dioxide given off per hour was calculated on the basis of 1 gm. of plantlet dry weight.

At first the respiration of healthy seeds was greater than that of infected. On the second day the differences disappeared, and later the infected seeds showed a higher respiration rate which reached the maximum on the seventh day. In plants at various stages of growth the differences were not physiological, the increased respiration in the infected plants being due to the development of the fungus. Experiments with stems showed that infected plants respired faster. Roots of healthy and of infected plants 15 days old showed no difference in respiratory activity.

The evaporation experiments showed that the infected plants give off more water than the healthy plants. No stimulating effect on the growth of wheat due to *U. tritici* was noted.

The functional decay of leaves, R. H. DASTUR (*Jour. Indian Bot. Soc., 4 (1925), No. 6, pp. 220–224*).—It is stated that in *Abutilon asiaticum* and in numerous other plants, the functional activities of the cells of the leaf mesophyll do not terminate all at once, but that they show signs of decay one

by one. The water supply appears to be concerned. Phenomena cited are, it is claimed, explainable only on the supposition that the smallest vascular tracheids from which the cells of the mesophyll obtain their water do not continue to perform their function as vigorously in very mature leaves as in the young leaves, and so the supply of water becomes inadequate, though transpiration still continues to be normal. The cells which are most distantly placed from these tracheids will be the first to suffer from this shortage of water supply, as nearly all the water will be utilized by the cells in the immediate vicinity of these tracheids. The water conducting elements at the margins of a leaf are thrown out of their function much earlier than those placed centrally because transpiration is always more vigorous from the marginal portions of a leaf than from the central portions. Further explanation is offered.

The functional decay of leaves, by R. H. Dastur.—A few critical remarks, R. S. Inamdar (*Jour. Indian Bot. Soc.*, *4* (*1925*), *No. 9–10*, *pp. 318–322*).—This is largely an expository and critical note on the article by Dastur above noted, which is mentioned as an abridged form of another article by Dastur which has been noted (E. S. R., 56, p. 126). Critical reference is made also to an implication by Briggs (E. S. R., 51, p. 730) as to the connection of the "reactive chloroplast surface" with the water supply.

Reciprocal effects from grafting, F. W. Hofmann (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 7*, *pp. 673–676*).—An investigation at the Illinois Experiment Station showed that reciprocal grafts can be made between *Phaseolus vulgaris* and *P. lunatus*. The longevity of the rootstock of *P. vulgaris* may be materially altered when *P. vulgaris* is top grafted with *P. lunatus*. Although anthocyanin is considered as a soluble glucoside, no passage of this pigment was observable in the graft symbionts between plants of anthocyanin and non-anthocyanin varieties. Seeds which developed on reciprocal grafts of *P. vulgaris* and *P. lunatus* produced plants which could be cross inoculated, thus showing that an altered bacterial symbiotic specificity had been brought about.

The flower behavior of avocados, A. B. Stout (*Mem. N. Y. Bot. Gard.*, *7* (*1927*), *pp. 145–203*, *pls. 5*, *figs. 12*).—The author aims in this paper to present the more important facts thus far determined regarding flower behavior in avocados, with more ample illustration by photographs and charts than has hitherto been possible. The report includes new data obtained in Florida for varieties not available in California.

Some abnormalities in the flowers of Cannabis sativa, S. R. Kashyap (*Jour. Indian Bot. Soc.*, *4* (*1925*), *No. 6*, *pp. 217–219*, *figs. 5*).—It is said that, while the sporophyte in *C. sativa* is potentially bisexual, ordinarily one sex dominates and is expressed externally. The factors determining the expression of one sex and the latency of the other are not known.

Erysiphaceae near Moscow [trans. title], A. N. Bukhgeim [Buchheim] (*Bolezni Rastenii*, *14* (*1925*), *No. 1*, *pp. 34–38*; *Ger. abs.*, *p. 38*).—A brief note is given on the collection, during 1922–1924, of Erysiphaceae in the neighborhood of Moscow, and of the distribution and biology of some of the forms.

GENETICS

The attachments of chromosomes at the reduction division in flowering plants, J. Belling (*Jour. Genetics*, *18* (*1927*), *No. 2*, *pp. 177–205*, *figs. 22*).—This is a contribution from the Carnegie Institution.

The hypothesis of chromosome affinity and the phenomenon of suppression of characters on crossing, E. Malinowski (*Jour. Genetics*, *18* (*1927*), *No. 2*, *pp. 223–231*).—A discussion of the relation of linkage phenomena with association between chromosomes.

Mutations in a haploid Datura, A. F. Blakeslee, G. Morrison, and A. G. Avery (*Jour. Heredity, 18 (1927), No. 5, pp. 193–199, figs. 4*).—This contribution from the Carnegie Institution records the genetic variations which have occurred with the haploid Datura line (1A) and suggests what bearing their occurrence may have upon the theory of the hybrid origin of mutants.

Imperfect hermaphroditism in flowers of Hibiscus removed by surgical operation, N. B. Mendiola (*Philippine Jour. Sci., 32 (1927), No. 1, pp. 65–74, pls. 4*).—By splitting the terminal portion of the staminal tube which imprisoned the stigmas and bending the split parts outward to expose the stigmas the author succeeded in rendering receptive Hibiscus flowers which are normally nonreceptive. Sex change was thus brought about by mutilation. A notable effect of stock on scion was observed in the case of the same variety of Hibiscus budded on a native red variety. The scion, although producing anatomically imperfect hermaphrodites and impotent pollen when grown on its own roots, yielded perfect hermaphrodites and perfect pollen when budded on another variety.

Self-fertilization in timothy, S. E. Clarke (*Sci. Agr., 7 (1927), No. 11, pp. 409–439, figs. 9*).—In continued studies (E. S. R., 49, p. 134; 53, p. 729) at the Minnesota Experiment Station, selection within self-fertilized lines of timothy for from 1 to 5 successive selfed generations resulted in relatively homozygous lines differing in hereditary morphologic characters. Chlorophyll deficient seedlings, mostly albinos, occurred frequently in selfed lines of timothy. The interaction of at least three complementary recessive factors, all of which must be present in a homozygous condition, seemed necessary for the production of a white seedling. The allelomorphs of these recessives are regarded as duplicate factors.

A marked correlation was found between the reaction of selfed lines to stem rust in the field and in the greenhouse. Resistance and susceptibility seemed to be differentiated by a single main factor with resistance dominant, although there was some evidence of modifying factors.

High and low self-fertility, as well as productivity, seemed to be inherited. Segregation occurred in the early selfed generations, after which many lines bred relatively true for seed production. While some plants were relatively fruitful, most appeared to be rather highly self-sterile. About 4 per cent as many seeds were produced per spike under self-fertilization conditions as by open-pollinated plants. While plants grown from open-pollinated seed were quite variable, most selfed lines appeared rather uniform after one or two generations of selfing. A few selfed lines were markedly reduced in vigor, but most compared favorably in productivity with the open-pollinated commercial strain. Although stem rust may greatly reduce timothy yields, the relationship seemed physiologic, as the characters of vigor and seed production were each inherited independently from rust reaction. Plant vigor and seed production appeared to be correlated to a certain extent. Selection within self-fertilized lines seemed to be an effective and practical means of improving timothy.

A contribution to the study of wild monococcum and dicoccum and their phylogenetic connection with one another and with cultivated varieties [trans. title], K. Flíaksberger (C. A. Flaksberger) (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant-Breeding), 16 (1926), No. 3, pp. 201–224, pl. 1, figs. 27; Eng. abs., pp. 224–234*).—A discussion of morphological and cytological evidence of the relationships of *Triticum aegilopoides*, *T. thaoudar*, and *T. dicoccoides* with each other and with cultivated wheats.

Annual versus biennial growth habit and its inheritance in Melilotus alba, H. B. Smith (*Amer. Jour. Bot., 14 (1927), No. 3, pp. 129–146, figs. 8*).—An investigation carried on at the University of Michigan and the Maine Experi-

ment Station indicated that a single gene determines the difference between annual and biennial growth habits in white sweet clover, annualcy being dominant. Evidence presented favored the view that the annual form originated by mutation from the biennial. Morphological and physiological differences between the two types are discussed, and the relationship between habit of growth and native habitat of the various species of Melilotus is shown.

Heredity of the garden pea [trans. title], L. KAZNOWSKI (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Econ. Rurale Pulawy*), *7* (*1926*), *A*, *pp. 1–91, figs. 10; Fr. abs., pp. 89–91*).—A comparison of cultivated pea varieties with the wild species, *Pisum elatius*, showed many striking differences; for example, the seed coat of the cultivated variety was three times as thick as that of the wild form. In the cultivated pea thickness of the seed coat is thought to depend upon at least two hereditary factors. The coefficient of water absorption was greatest in the cultivated pea, medium in the field pea, and lowest in *P. elatius*, where absorption was very slow. Five distinct colors were observed in pea plants, namely, white, golden yellow, yellowish green, clear green, and deep green. Mutations were observed as follows: In *P. arvense* forms with fasciated stalks, in *P. sativum* a form with small seeds, black hila, and yellow cotyledons, and in a cross between Victoria and Telephone a narrow leafed rogue.

The comparative genetics of colour in rodents and Carnivora, J. B. S. HALDANE (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc.*, *2* (*1927*), *No. 3*, *pp. 199–212*).—The action of different genes identified in the mouse, Norway rat, black rat, deer mouse, guinea pig, rabbit, dog, cat, and ferret is tabulated and discussed from the standpoint of similarity of action in the different species. It appears that the recessive mutations are homologous, while there is some doubt about the homology of dominant mutations. There appears, however, to be a difference in the tendency of different genes to mutate, and particular genes do not seem to have a greater tendency to mutate in one species than in another. Examples of chemical reactions analogous to the mutations are frequently mentioned.

The inheritance and transmission of the characters "capacity for fat production," C. W. TURNER and W. GIFFORD (*Missouri Sta. Bul. 244* (*1926*), *p. 34*).—In a study of the progeny performance records of 404 Jersey sires having 10 or more register of merit daughters and of 175 Ayrshire sires having 5 or more advanced registry daughters, it was found that for each 100 lbs. increase in the dam's annual production of fat there was an average increase in the daughter's records of approximately 10 lbs. of butterfat for the Jerseys and 20 lbs. for the Ayrshires. Simple formulas were established for indicating the relation between the sons' daughters' yearly production and the average of the sires' daughters' production in the two breeds. The dam's performance was concluded to be a poor index to her transmitting ability to her granddaughters. Her sire's average progeny performance was a better indication in both breeds.

Among the 981 calves born in the station herd, there were 12 pairs of twins, of which 7 were of like sexes, while 5 were male and female.

Inheritance of milk production in cattle [trans. title], K. VON PATOW (*Ztschr. Tierzüchtung u. Züchtungsbiol.*, *6* (*1926*), *Nos. 2*, *pp. 297–354; 3, pp. 529–604*).—This is a review of various studies made of the inheritance and transmission of milk and fat production in dairy cattle, dealing with the relation to conformation, persistence of production, blood lines, inbreeding, prepotent individuals, Mendelism, statistical studies, and cytological investigations.

Inheritance in poultry (*Rhode Island Sta. Rpt. 1926, pp. 45, 46*).—The F_1 and F_2 offspring resulting from crossing Brahmas with Leghorns were inter-

mediate in body weight, but nearer to the Brahmas. Bone growth appeared to stop between the fifth and seventh month, but body weight increased until the tenth month in both breeds. A few F_1 female crosses attained a weight fully equal to that of Brahmas.

Means of movement of spermatozoa of mammals and their phyletic evolution [trans. title], E. F. POTAPKOV (POYARKOV) (*Biul. Sred. Aziatsk. Gosud. Univ.* (*Bul. Univ. Asie Cent., Tachkent*), *No. 15* (*1927*), *pp. 293–306, fig. 1; Fr. abs., p. 306*).—The author shows that the direct movement of spermatozoa is the result of unilateral contractions of the tail coupled with a rotary movement about its long axis. The rotary movement results from the shape of the head. The evolution of different forms of spermatozoa as represented by different mammals is discussed.

Antagonistic influence of the hormones of the gonads, I, II [trans. title], E. STEINACH and H. KUN (*Biol. Gen.*, *2* (*1926*), *No. 7–8*, *pp. 815–834, figs. 7*).—The results are presented of tests in which repeated doses of the ovarian hormone injected into male rats at six weeks of age were found to reduce materially the rate of growth of the penis, testicles, and prostate glands without apparent effect on the rate of gain in body weight.

The effect of X-ray sterilization on the development of the accessory organs of reproduction in the mouse, I, II, A. S. PARKES and F. W. R. BRAMBELL (*Jour. Roy. Micros. Soc.*, *47* (*1927*), *No. 2*, *pp. 97–106, pls. 3*).—Histological studies involving the uterus, vagina, and clitoris of the mice sterilized by X-rays at or before birth in the investigations previously noted (E. S. R., 57, p. 324) indicate that, though such treatment destroyed all follicles in the ovaries, there was usually no inhibition in the development of the accessory reproductive organs. In the few cases in which the ovarion tissue became luteallike, development of these organs was somewhat inhibited.

On some fundamental laws of ovarian dynamics, A. LIPSCHÜTZ (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc.*, *2* (*1927*), *No. 3*, *pp. 263–280, figs. 7*).—The author discusses the physiological reaction of entire and castrated male and female animals to ovarian grafts taken from females of different ages, from which the following conclusions are drawn:

The number of follicles ripening and the number of corpora lutea forming depend not upon the total number of primary follicles present, but upon general internal factors outside the ovary (law of follicular constancy). The time at which endocrine activity of the ovary sets in is dependent upon the age of the internal environment and is independent of the age of the ovary (law of puberty).

Growth substances which are not sex specific are completely utilized for growth up to a certain point. After this stage these same substances are available to stimulate the development of follicles. A sex specific action of ovarian grafts in castrated males and females is indicated by the differences in behavior of the individuals of the two sexes and by the tendency for the normal development of follicles and the formation of corpora lutea in the female and the tendency to follicular atresia in the male.

FIELD CROPS

[Field crops investigations in Missouri, 1925–26], W. C. ETHERIDGE, L. J. STADLER, B. T. KIRKPATRICK, B. M. KING, C. A. HELM, T. J. TALBERT, and J. T. QUINN (*Missouri Sta. Bul. 244* (*1926*), *pp. 37–43, 47, figs. 3*).—Agronomic work (E. S. R., 54, p. 722) reported on included breeding work with wheat, oats, and corn; varietal studies with wheat, oats, soy beans, and cotton; planting tests with soy beans and potatoes; trials of certified seed potatoes; and classi-

fication work with soy beans. The comparative response of Sunrise kafir and corn in variously treated rotations is shown.

In studies of the variability of crossing-over in the *C–sh* and *Sh–Wx* regions in corn, young tassels of heterozygous plants were irradiated (X-rays) at various dosages during the maturation period of the male germ cells. Irradiation at the greater dosages resulted in the death of much of the pollen and in some cases in distortion of the tassel. No significant difference existed in crossover percentage in treated and untreated tassels of the same plants at any dosage used. From preliminary studies it appeared that mutation in some genes for endosperm characters occurred frequently enough to be susceptible to quantitative experimental investigation by the method outlined.

Of the highest yielding cotton varieties, Trice and Delfos generally gave the best returns on the heavy or very fertile soils of the southeast Missouri lowlands, while Express and Acala led on the lighter soils. Express and Trice yielded the most seed cotton on Ozark upland soils and at the station. Plants (2 to 4) in hills 10 to 12 in. apart averaged 229 and 327 lbs. more seed cotton, respectively, than single plants 12 and 18 in. apart. Fertilizer tests in several localities are commented on.

[Field crops work in Porto Rico in 1925], T. B. McClelland, R. L. Davis, and J. A. Saldaña (*Porto Rico Sta. Rpt. 1925, pp. 13, 14, 15, 16, 17–22, figs. 2*).—Continued investigations reported on were concerned with the keeping qualities of yautias, dasheens, and taros during storage at normal temperature, comparisons of different species of Crotalaria for cover crops, breeding work with corn and sugar cane, and trials of seedlings and introduced varieties and spacing and cultural tests with sugar cane.

Leaf-color studies in germination flats indicated that corn seedlings with medium green leaves are more resistant to drought than are those having light or dark green leaves. In a comparison of corn strains from different localities, corn from Penuelas has given the highest average yield and has furnished the highest yielding individual ear, which, in turn, has produced the highest yielding selfed lines.

P. O. J. 2725, followed by P. O. J. 2714, has been promising among the introduced sugar cane varieties. A spacing experiment showed Java Unknown and Uba, thin-stemmed prolific sorts, to yield the most sugar from the closest spacings, either 6 by 2 or 5 by 2 ft. Although the sucrose percentages were not markedly different, the purity tended to decline with the wider spacing. Tests indicated the desirability of eliminating few-suckered seedlings at from 2.5 to 3.5 months. Significant observations on seed and the production of seedlings have been recorded from another source (E. S. R., 55, p. 640).

[Field crops experiments in the Philippine Islands], S. Youngberg (*Philippine Bur. Agr. Ann. Rpt., 25 (1925), pp. 24–30, 90–92, pls. 4*).—The continuation of investigations with various field crops is again reported on (E. S. R., 55, p. 434).

Breeding improved varieties of forage crops, L. E. Kirk (*Jour. Amer. Soc. Agron., 19 (1927), No. 3, pp. 225–239*).—Recent breeding experiments with forage crops are reviewed, with a summary account of improvement work with red clover (E. S. R., 53, p. 229), alfalfa, brome grass, slender wheat grass, and sweet clover (E. S. R., 54, p. 736; 55, p. 523), at the University of Saskatchewan. Controlled pollination with selection of the more desirable selfed lines appeared to be the most promising mode of attack for the improvement of normally cross-fertilized crops after adapted varieties have been obtained.

Progress and possibilities in forage crop improvement, P. C. Mangelsdorf (*Jour. Amer. Soc. Agron., 19 (1927), No. 3, pp. 239–242*).—Discussing the above paper, the author points out that continuous selection has not been

conspicuously successful in the improvement of cross-pollinated forage crops, that the present trend is toward selection in self-fertilized lines, that hybridization has not played the part deserved in breeding work with forage crops, and that a wider knowledge of the genetics of important forage crops is needed.

The accurate determination of dry matter in forage crops, G. P. McRostie and R. I. Hamilton (*Jour. Amer. Soc. Agron., 19 (1927), No. 3, pp. 243–251*).—In forage crop experiments at the Central Experimental Farm at Ottawa, wherein the yield (absolutely dry weight) per 1,000 plants of western rye grass and acre yields of cured hay of varieties of red clover, alfalfa, and sweet clover were considered, the inclusion of the border foot in plats surrounded by cultivated paths seemed to be associated with inaccuracy of result.

Studies of the influence of the method of sampling and drying on the relative amount of dry matter obtained, employing hay mixtures, alfalfa, red clover, timothy, corn, and sunflowers, led to the conclusion that the use of either green weights or the yield of field-cured hay as a basis of comparison in test plats is unreliable. Computation of yields of comparative test plats on the basis of the moisture loss of shrinkage samples dried to a constant weight, while reliable for detection of reasonably large differences, still possesses an appreciable variable factor. There appeared to be an appreciable and variable loss of dry matter in shrinkage samples held for air drying before being finally oven dried. Immediate drying of shrinkage samples seemed to offer the most accurate criterion for comparative tests.

The effects of rotations, fertilizers, lime, and organic matter on the production of corn, wheat, and hay, T. K. Wolfe and M. S. Kipps (*Virginia Sta. Bul. 253 (1927), pp. 50, figs. 32*).—Experiments concerned with the effects of crop rotations, fertilizers, lime, and organic matter on the yields of corn, wheat, and hay were conducted during the past 20 years at the station on Hagerstown silt loam soil.

Corn was greatly benefited by crop rotation and wheat to a lesser extent, whereas continuous hay reseeded in alternate years outyielded hay in rotation with corn and wheat. Considering all crops, it seemed much more profitable to grow crops in rotation than otherwise. While stable manure and floats greatly increased crop yields, acid phosphate apparently surpasses floats for Virginia soils. Stable manure and floats with crop residues resulted in crop yields greater than without crop residues. A 2-year rotation, corn and millet, was unsatisfactory and rapidly reduced soil productivity. The 3-year rotation, corn or millet, wheat, and clover, deemed suitable for grain farming; the 4-year rotation, corn, wheat, and grass and clover, 2 years for the general farmer; and the 5-year rotation, corn seeded to crimson clover and vetch, soy beans, wheat, and grass and clover 2 years, indicated for the dairy and livestock farmer, were about equally valuable as measured by money returns.

In the 4-year rotation acid phosphate alone has given the most profitable returns, although soil productivity decreased with acid phosphate applications. Potassium chloride applied with acid phosphate gave slightly larger yields than acid phosphate alone and about maintained fertility. This combination produced better stands and crops of clover and gave more vigorous, healthier, and larger crops of corn and wheat than any commercial mixtures, excepting the complete fertilizer. Although the latter gave the highest yields, the cost of the increase does not advise its use. Floats gave better results in the late than during the earlier years of the experiment, but it did not approach acid phosphate in effectiveness. Stable manure gave excellent results with all crops. With a limited supply and much land to be manured small frequent applications are advised rather than large applications less often.

Treatments increasing corn yields most similarly improved the quality of the crop. In the 3-year rotation as much as 2,200 lbs. of acid phosphate per acre in one application did not burn up the crops and indeed resulted beneficially.

Lime (E. S. R., 52, p. 422) applied directly greatly increased the yields of continuous corn and wheat. Burnt lime, ground limestone, lime marl, and precipitated marl appeared of equal merit when applied to give equivalent amounts of calcium and magnesium carbonates. Both ground limestone and burnt lime improved the physical properties of the soil under continuous cropping and under rotation.

Crop residues seemed to be the cheapest source of organic matter, quite beneficial in increasing crop yields, and to furnish more organic matter than stable manure. Green manure crops which do not displace other crops in the rotation are held of value. Crimson clover and vetch proved to be excellent manure crops where stands could be readily secured, whereas rye was unsatisfactory. Buckwheat surpassed rye but was considered less effective than crimson clover and vetch, and soy beans seemed too expensive for use as green manure.

Experiments with crops for soiling, 1906–1911 [trans. title], H. Bagge (*Tidsskr. Planteavl, 33 (1927), No. 1, pp. 149–196*).—The work described consisted of experiments conducted in different parts of the country for a series of years with fall-sown crops and crop mixtures, and with crops following these, for use in soiling. Of the mixtures of leguminous crops with rye, winter barley, and wheat, rye and wheat gave about equal results on clay soils with a high content of organic matter; but on light sandy soils the rye mixtures gave the better yields. The mixtures of grain and vetch, as compared with grain and winter peas, resulted in the better stands and higher yields. Rye alone and mixed with vetch gave rather uniform yields on good soil, but on the poorer sandy soils rye alone did not yield as well as when mixed with some leguminous crop. The use of legumes in the mixture gave a marked increase in the production of nitrogen in the crop. It is recommended that relatively more grain be used in the mixtures for good soils and more seed of the leguminous crops for sandy soils.

The results of experiments with soiling crops grown after the winter crops above described showed that yellow mustard gave 29 per cent, a buckwheat mixture 38 per cent, and an oats and vetch mixture 43 per cent of the yield produced by turnips.

Experiments on preparing the land and establishing meadows on moor soils, 1910–1925 [trans. title], C. J. Christensen (*Tidsskr. Planteavl, 32 (1926), No. 4, pp. 560–624*).—Tests are reported of different methods of soil preparation and treatment preparatory to establishing meadows of various grass mixtures on well-drained low moor soils still carrying the natural vegetation. The best results were secured when the ground was broken and used for growing crops, mainly oats and root crops, for about three years and sowing the grass seed mixture into the harrowed surface after the removal of the root crop. The seed mixture used consisted of red clover, alsike clover, white clover, bird's-foot trefoil, Italian rye grass, English rye grass, meadow fescue, orchard grass, timothy, meadow foxtail, bluegrass, and rough-stalked meadow grass.

The use of cover crops increased the first year's yield and gave larger returns when the cover crop was allowed to ripen than when cut green. A thickly sown cover crop gave a larger yield than a thinly sown crop at maturity. A sand covering applied upon sowing the seed mixture produced a beneficial effect lasting for several years.

Tests of sowing the seed mixtures at different dates showed that spring sowing and summer sowing about August 1 gave practically the same results.

When sown later in the summer there was danger that the clovers and other legumes would not develop sufficiently to be winter-resistant.

Studies on bog-hay, R. E. Evans (*Welsh Jour. Agr., 3 (1927), pp. 119–147*).—Investigations by the University College of North Wales showed a wide variation in the botanical composition of the so-called bog hay and that some types were superior to others in chemical composition. Bog hay cut early surpassed that cut later, especially in mineral content. Application of basic slag to bog areas encouraged the growth of better herbage, wild white clover appearing to a small extent. Phosphatic fertilizers appeared to have a more pronounced effect on the mineral content of the hays than on other constituents. Drainage seemed to render artificial fertilizers more effective. Complete fertilizers gave more and better hay than did incomplete fertilizers. Ammonium sulfate and kainit affected yield and composition of the natural herbage on peaty soil less than basic slag. While unfertilized bog hay is deficient in ash, phosphoric acid, lime, and chlorine, the percentage of these constituents is considerably increased by artificial fertilizers, especially basic slag.

The control of pasture on some farms in Finland (Suomi) in 1925 [trans. title], C. A. G. Charpentier (*Statens Lantbruksförsöksverks.* [*Finland*], *Vetensk. Pub. 7 (1927), pp. 73, pls. 3, figs. 9; Eng. abs., pp. 71–73*).—The pasture studies reported dealt with the comparative productivity of different types of pastures, milk production, pasture management, and production costs.

A method of harvesting grain in variety tests, G. L. Schuster (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 357, 358, figs. 2*).—The method described and illustrated in this contribution from the Delaware Experiment Station provides for the field storage of cereal plants until they are ready to thresh.

Svalöf Princess II barley [trans. title], H. Tedin (*Sveriges Utsädesför. Tidskr., 36 (1926), No. 6, pp. 345–347*).—A comparison is reported which indicates by the tabulated results that Princess II barley is fully equal in value, quantitatively and qualitatively, to Princess. Princess II is a cross between Princess and Chevalier II made with a view to obtaining a variety uniting the high-yielding capacity of Princess with the satisfactory malting quality of Chevalier II.

Effect of rate and method of application of fertilizer on the germination of white beans, C. E. Millar and J. F. Mitchell (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 270–279, figs. 5*).—Comparatively small quantities of Anaconda phosphate were injurious to the germination and the sprouts of field beans when applied in contact with the seed or above the seed in tests at the Michigan Experiment Station, whereas 350 lbs. applied broadcast and thoroughly mixed with the surface 2 in. of soil did not retard germination. Chemically pure monocalcium phosphate was much less toxic to the sprouts and not nearly so detrimental to germination.

As much as 350 lbs. per acre of 16 per cent acid phosphate in direct contact with the seed did not decrease germination. Rates of 50 lbs. and less in direct contact with the seed in sandy loam stimulated the early growth of bean plants, while 200 lbs. and more resulted in retardation of growth. Rates of as much as [illegible]0 lbs. placed above the seed caused no decrease in germination or injury to the plants in sandy loam. Complete commercial fertilizer, 3–12–4, proved more toxic than 16 per cent acid phosphate when applied in direct contact with and above the seed.

Productivenes of certain varieties of corn in Illinois, G. H. Dungan and [illegible] L. Burlison (*Illinois Sta. Bul. 294 (1927), pp. 569–583*).—Varietal tests with corn at DeKalb indicated Golden King, Western Plowman, Strout Red,

Will County Favorite, and Hecker Red as best for northern Illinois. In central Illinois at the station the highest yielders included Illinois Two-Ear, Illinois High Yield, Reid Yellow Dent, Golden King, Will County Favorite, Western Plowman, and Boone County White. On the Alhambra field in southwestern Illinois, where chinch bug injury has been serious, the best yields were returned by Mohawk, Black Hawk, Champion White Pearl, and Democrat. Outstanding among varieties at Fairfield in southeastern Illinois where chinch bugs were not serious during the tests were Perrine White Pearl, Funk 90 Day, Sutton Favorite, Reid Yellow Dent, Democrat, and Champion White Pearl.

The development of the Egyptian cotton plant, M. A. Bailey and T. Trought (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 60 (1926), pp. [1]+46, pls. 13*).—The studies reported were largely made with Assili and Sakel Egyptian cottons at the experimental farm at Giza during 1922, 1923, and 1924.

The normal period of development of a flower bud of cotton in Egypt appeared to be not less than 42 days and that required for completion of boll development about 52 days. Diseased bolls open sooner than healthy bolls, and the shortening of the period is roughly proportional to the severity of the disease. Plants grown in boxes had a much shorter period of boll development than those in the open field, and those grown under drought conditions also showed a somewhat shorter boll maturation period, the determining factor in both cases probably being soil temperature.

In tracing the development of the fruiting branch of the Egyptian cotton plant, it was shown that before the first internode of a fruiting branch has reached its final length at least four succeeding internodes have started to develop. The average rate of elongation of an internode and its average extent of elongation fall steadily with each consecutive internode, whereas the period of elongation is practically similar for all, with a slight suggestion of an increase in period in the more distant internodes. The existence of regular flowering intervals in Egyptian cotton plants was demonstrated, and the intervals were shown to be of a similar order to those found by Harland in Sea Island cotton (E. S. R., 40, p. 627).

In the plants observed, the minimum temperatures occurring at the time when the bud primordia were being differentiated had no effect on the interval between flowers opening about 42 days later. No relation was apparent between the length of the interval between successive flowers and the length of the internodes at the ends of which the flowers are borne. Slight variations found between the average flowering intervals of different plants were not related to obvious external differences in the plants and seemed genetic in character.

The flowering curve for a single plant differed in form from the average curve and was rhythmic in character. The wave length was about 6.5 days and apparently identical in 1923 and 1924. The origin of the regular periodicity of these curves is believed to be connected with the average flowering intervals of the plants, with a certain carryover of flowers from one day to the next.

Growing flax in Kansas, H. H. Laude and W. E. Grimes (*Kansas Sta. Circ. 133 (1927), pp. 10, fig. 1*).—Cultural and harvesting methods and varieties are suggested for growing seed flax in southeastern Kansas. Variety tests are reported, and the status and prospects of the crop in the State are discussed briefly.

Flax-wheat mixtures under irrigation, C. McKee (*Montana Sta. Bul. 202 (1927), pp. 16, figs. 5*).—Investigations at the station during the period 1923–1926 showed that flax and wheat grown together in proper proportions gave total yields significantly larger than those from either crop seeded alone. Flax and Marquis wheat mixed at the rates of 14 and 30 lbs., respectively, and also at 14 and 45 lbs. per acre produced the most economical returns, yields

averaging over 25 per cent more than from either crop in pure culture. During 3 years the gross return from either of the mixtures was about $13.50 per acre more than that from wheat alone. Material increases in the rate of seeding for wheat resulted in a sharp decrease in the flax yield in the mixture, and similarly an increase in the flax rate produced a marked decrease in the wheat yield. Experiments at the Judith Basin Substation indicated definitely that there is no advantage in seeding flax-wheat mixtures on nonirrigated land, where moisture is a limiting factor in crop production. The advantages and disadvantages of the mixed crop are cited, and cultural directions are outlined briefly.

Data obtained by the station indicated that flax alone returns as large a gross profit per acre as spring wheat when grown side by side under irrigation, and flax appeared at least equal to spring wheat under irrigation at Huntley on the basis of gross value per acre. Experiments under irrigation at Huntley proved that land continuously cropped to flax yields much less than when the crop is in a suitable rotation. Fargo Common, Reserve, and N. D. R. 114 gave the highest average yields of the 8 flax varieties grown under irrigation at the station.

Japanese barnyard millet: A new forage for the coast section, A. E. Engbretson (*Oregon Sta. Circ. 80 (1927), pp. 4, figs. 2*).—Japanese barnyard millet is recommended for soiling or green feed between spring-planted oats or oats and peas and early fall turnips, i. e., August 10 to September 30. Its culture and utilization are discussed briefly.

Yield studies in oats: The effect of the pre-treatment of the parent crop upon the seed produced, its germination, and subsequent growth, M. G. Jones and M. A. H. Tincker (*Ann. Appl. Biol., 13 (1926), No. 4, pp. 535–559, figs. 5*).—The influence of environmental (including cultural) conditions on certain agronomic characters of Record oats was studied at the Welsh Plant Breeding Station. Seed grading by weight seemed beneficial but did not improve seed quality in every respect. Among a number of seed treatments, heating the seed (75° C. for 15 minutes prior to planting) appeared to give information on vigor of seed which seemed to be correlated with yield. Variation between spaced plants was so wide that seedling behavior gave little indication of the plant's capabilities.

Experiments with fall-sown oats in the South, T. R. Stanton, R. R. Childs, J. W. Taylor, and F. A. Coffman (*U. S. Dept. Agr. Bul. 1481 (1927), pp. 32, pl. 1, figs. 9*).—Varietal, fertilizer, and cultural experiments with fall-sown oats in southeastern United States made in cooperation with the Georgia College of Agriculture are summarized, with brief cultural recommendations.

Climatic data indicated that winter temperature is the limiting factor in fall-sown oats production, the northern limit being defined by the isotherm of 30° F. The area between isotherms 30 and 20° constitutes a transitional zone in which both spring-sown and the hardier varieties of fall-sown oats can be grown successfully. South of isotherm 20° fall-sown oats is a fairly certain crop, except in unusually cold seasons, when stands are reduced by winterkilling.

Strains of Winter Turf oats, followed by Culberson, have produced the highest average yields during the last 15 years in plat tests at Arlington, Va. Lee, developed from Winter Turf×Aurora, has, on the average, outyielded other sorts during the years tried. Strains of certain tender types such as Fulghum and Hatchett gave better returns in nursery tests than in field plats, equaling the yields of Winter Turf and Culberson. Strains of Red Rustproof, e. g., Hastings (Hundred Bushel), Bancroft, and Coker Appler, were outstanding at Athens in northern Georgia and at Tifton and Quitman in southern Georgia.

Fulghum yielded next to Hastings and Bancroft at Athens and decidedly outyielded the best Red Rustproof strains at Ashburn. Yield data from other southern experiment stations indicate that in the Cotton Belt the various strains of Red Rustproof and Fulghum varieties are the most satisfactory, while immediately north of the Cotton Belt hardier varieties such as Winter Turf, Culberson, and Lee are better adapted.

From October 10 to 18 seemed about the optimum seeding date for winter oats in northern Georgia, while in southern Georgia seeding could be delayed until November 1. A 6-pk. rate per acre for Red Rustproof and 10 pks. for Fulghum produced the highest average yields. While open furrow and ordinary drilling differed little in average or favorable years, the open furrow method of seeding winter oats affords considerable protection against winterkilling. When methods of seed bed preparation were compared on corn ground double disking produced as high as plowing, with a decided lesser cost of production. Rotation tests indicated that oats should follow crops that can be removed in time to permit early fall seeding of oats.

Acid phosphate at the rate of 200 to 400 lbs. per acre in the fall at seeding, followed with a top-dressing of 100 to 150 lbs. of sodium nitrate about March 1 surpassed other fertilizer combinations. Ammonium sulfate applied at from 80 to 100 lbs. per acre could replace the sodium nitrate. Around March 1 seemed the proper time for applying nitrogenous fertilizers to fall-sown oats in northern Georgia, and about February 1 in the Coastal Plain. No advantage came from applying nitrogenous fertilizers in two separate applications. Potassium fertilizers paid for their application on Coastal Plain soils but not on Piedmont soils.

Maintaining potato yields by hill selection, G. Stewart and D. C. Tingey (*Utah Sta. Bul. 200 (1927), pp. 32, figs. 11*).—Data from an additional 5 years of work supplement those recorded in an earlier report (E. S. R., 45, p. 131). Varieties previously termed Bangor, Peerless, and Majestic proved to be Triumph, Pearl, and Rural, respectively. Continued yearly selection of seed from the highest yielding hills of Rural has maintained yields. Infection of unselected stock with rugose mosaic and leaf roll resulted in low yields, although complete running out was not caused thereby. During 8 years Rural stock introduced in 1918 from Cornell University and thereafter similarly hill selected gave yields about equal to the Utah selected stock, both yields being about double that of the unselected stock.

Potatoes, W. B. Mack (*Pennsylvania Sta. Bul. 210 (1927), pp. 18–22*).—Fertilizer experiments with potatoes during 1918–1926, inclusive, dealt with formulas, rates of application, carriers, and comparisons involving fertilizers, manure, and cover crops.

Phosphorus was the only element giving a consistent significant gain during the first 4 years. Variations in analysis and formula did not affect the yield measurably. While manure produced increases in the year after application, large quantities did not result better than the smallest quantity, 20 tons per acre, unsupplemented with fertilizer. Phosphorus also produced the largest gains during the last 5 years and did better with potassium than with nitrogen. Nitrogen did not make significant increases in any combination, nor was there advantage in adding it in two applications instead of one. The minimum quantities of nitrogen and potassium were as effective as the larger. Manure alone was responsible for large yield increases, and 10 tons decidedly surpassed a rye cover crop when both were combined with fertilizer.

A summary of experiments on the manuring of potatoes in Anglesey, Caernarvonshire, Denbighshire, and Flintshire, 1892–1925, E. J. Roberts (*Welsh Jour. Agr., 3 (1927), pp. 169–196*).—In fertilizer trials with

potatoes at numerous centers in North Wales during the period 1892–1925, application of 10 or 15 tons of manure resulted in crop increases averaging over 4 tons, or 74 per cent, although an extra 10 tons did not give a significant increase. Replacing manure by artificial fertilizer in the rotation of one root crop and several years of grass was not followed by a smaller crop. In most cases complete fertilizers added to manure gave increased yields. Moderate dressings of complete fertilizers were as effective as those twice as large when added to manure. Quick acting nitrogenous fertilizers were of slight effect with manure, phosphorus, and potassium.

[Potato investigations in Germany in 1921 and 1922], P. KNOBB (*Arb. Forschungsinst. Kartoffelbau, No. 8 (1927), pp. XII+182*).—Investigations with potatoes (E. S. R., 48, p. 134) reported on in summary form from a number of experimental centers were concerned with soil preparation, the preceding crop, fertilizers and fertility practices, seed, planting, seed production, origin and breeding, diseases and their control, harvesting, storage, and miscellaneous problems.

A note on the growth phases of rice varieties, K. RAMIAH (*Jour. Madras Agr. Students' Union, 15 (1927), No. 2, pp. 40–49*).—The comparative behavior of rice varieties grouped as to height and maturity is described for growth stages from germination to maturity.

Hybrid vigor in sorghum, A. B. CONNER and R. E. KARPER (*Texas Sta. Bul. 359 (1927), pp. 23, figs. 6*).—Heterosis was measured by the height of plant in sorghum crosses (E. S. R., 57, p. 126) involving a series of three varieties or strains each of milo and feterita having a corresponding common distinctive height and known as Extra Dwarf, Dwarf, and Standard.

Marked hybrid vigor accompanied intervarietal crosses between milo and feterita in both F_1 and F_2 generations. In the three crosses between different varieties the F_1 showed an average increase of 66 per cent in height of plant over the tall parent and the corresponding F_2's 40 per cent over the tall parent. These crosses also exhibited unusual hybrid vigor in the size of leaves, chlorophyll development, and grain production, and were characterized by marked delay in maturity.

Hybrids between strains of the same variety where the parents differed apparently only in plant height showed no heterosis where the height factors were due to a single factor and of the same allelomorphic pair. In Extra Dwarf×Dwarf milo complementary factors for height gave an increase over the tall parent in both F_1 and F_2 generation progeny. Crosses between strains of the same variety either exhibited no hybrid vigor or displayed it only in plant height.

Hybrid vigor may be of value in evolving new and meritorious combinations. An understanding of its expression may enable the grower to keep his seed pure and to rogue fields of pure strains. It is also of potential value in the study of the relationship of the different sorghum varieties.

Sugar-cane experiments in the Leeward Islands [1924–25], A. H. COLLENS ET AL. (*West Indies Imp. Dept. Agr., Leeward Isl. Sugar-Cane Repts., 1924–25, pp. [2]+29*).—Trials of sugar cane varieties and seedlings in Antigua and St. Kitts-Nevis are reported on in continuation of earlier work (E. S. R., 55, p. 738). Hurricane damage rendered the experiments on Montserrat valueless. Besides B. H. 10 (12), the results indicate B. 6308, B. 3022, B. 6388, B. 4482, B. 4596, Sealy Seedling, and B. 156 to be the best canes for Antigua conditions, both as plant canes and ratoons.

The distribution of the roots of sugar cane in the soil in the Hawaiian Islands, H. A. LEE (*Plant Physiol., 1 (1926), No. 4, pp. 363–378, figs. 5*; also in *Planter and Sugar Mfr., 78 (1927), No. 18* [illegible]

developed at the Hawaiian Sugar Planters' Experiment Station for studying the distribution of sugar cane roots in boxes and under field conditions are described in detail, and 16 excavations of 5 plants each under very divergent environmental conditions are reported.

In sugar cane growing in furrows a high proportion, more than 58 per cent, of the roots was found in the topmost 8 in. of the soil. In hilled up cane most of the roots were in the 8- to 16-in. soil level. In cane either hilled up or in furrows more than 85 per cent of the roots was found in the topmost 24 in. The root masses from the uppermost soil levels were in many cases light brown in color, while root masses from the lower levels in the soil were a darker brown or even black. There were many more secondary roots with actively feeding surfaces in the root masses from the upper soil levels than in the masses from greater depths, and these secondary roots gave the lighter brown color to root masses near the soil surface. Rots of the root cortex were also more general in the lower soil depths, and these gave a darker color to the root masses from the lower depths.

The sugar industry of Peru, A. H. Rosenfeld (*Facts About Sugar, 21 (1926), Nos. 50, pp. 1180–1183, figs. 5; 51, pp. 1204–1207, figs. 7; 52, pp. 1234–1237; also in Trop. Plant Research Found.* [*Wash., D. C.*] *Sci. Contrib. 6 (1926), pp. 27, figs. 12*).—From a survey of the west coast of Peru information is given on the history, environmental conditions, soils, irrigation, sugar cane varieties, cultural methods and field practices, crop pests, production statistics, and a list of sugar mills.

Bright tobacco in Georgia, J. M. Carr (*Georgia Coastal Plain Sta. Bul. 7 (1927), pp. 28, figs. 9*).—Varietal and fertilizer experiments with bright tobacco (E. S. R., 56, p. 523) in cooperation with the Georgia College of Agriculture and the U. S. Department of Agriculture are reported, with recommendations concerning soils, plant beds, cultural, harvesting, and curing practices, liming, and the reduction of injury by insects and nematodes. The effect of weather conditions on the crop is noted briefly.

The Jamaica and Yellow Pryor varieties, followed by Cash, have given the best acre returns in tests on a heavy phase of Norfolk sandy loam. It was evident that yield and quality are considerably increased by properly topping and suckering.

Extensive comparison of formulas and sources of fertilizer materials, together with preliminary tests of burning quality, have suggested the use of 1,000 lbs. per acre of an 8-3-5 mixture, the phosphorus coming from acid phosphate; one-half the nitrogen from sodium nitrate alone or with ammonium sulfate and the other half from organic sources; and the potassium from potassium sulfate or a mixture of the sulfate with high-grade potassium chloride, the chloride supplying not more than one-half of the potassium. From 2 to 4 tons of well-rotted horse manure applied in the drill is recommended in addition to the mixed fertilizer.

Blackhull wheat in Kansas, S. C. Salmon, C. O. Swanson, and H. H. Laude (*Kansas Sta. Bul. 241 (1927), pp. 24, figs. 3*).—The merits of Blackhull wheat as compared with Turkey, Kanred, and other sorts are described from the results of varietal trials, agronomic and meteorological observations, and milling and baking tests.

Blackhull has a stiffer straw and lodges less than other hard red winter wheats and heads and ripens rather earlier, which enables it to avoid somewhat the effects of hot winds and drought. The threshed grain can not be differentiated with certainty from that of other hard red winter wheats. Blackhull showed no particular resistance to rust, stinking smut, or to Hessian fly. As an average of numerous trials it has outyielded Turkey and Kanred except in north-

western Kansas where it has winterkilled. Blackhull outyielded Kanred and Turkey at the station, Fort Hays, and Garden City, surpassed Turkey but yielded less than Kanred at Colby, and produced less than either at Tribune. It proved less resistant to low temperatures than the commonly grown strains of Turkey. The possibility of recurring severe winter losses does not recommend Blackhull for the northern, western, and especially the northwestern parts of Kansas. "Blackhull will perhaps prove to be the most satisfactory variety for limited areas in south-central Kansas where a stiff straw and earliness are more important than ability to survive low temperatures."

Blackhull ordinarily tests from 2 to 3 lbs. per bushel more than Turkey and Kanred, but it has a thicker bran and produces little if any more flour. Although it contains as much protein as the Turkey types, its protein is not so strong. The flour has some of the characteristics of a soft wheat flour. Yield and baking trials failed to show any material difference in favor of a recently distributed new strain known as Superhard Blackhull.

On the quality of bread from wheats supplied with nitrogen at different stages of growth, W. F. GERICKE (*Cereal Chem., 4 (1927), No. 2, pp. 73–86, figs. 6*).—Six varieties of spring wheat, ranging from early to late and varying fairly widely in capacity to change in protein content (E. S. R., 54, p. 323), received acre equivalents of 100 lbs. of nitrogen at planting or at one of several subsequent growth stages at the University of California.

Chemical and baking studies on the mature grain showed that in every case where nitrogen was applied 45 or 75 days after planting the resultant grain was decidedly higher in protein than that from wheat either not fertilized with nitrogen or fertilized at planting. Pusa and Sonora differed from the other sorts in that the protein content of the grain did not increase with later applications of nitrogen. In Bunyip and Hard Federation, loaf volume rose proportionally with increase in percentage of protein of the grain, whereas it decreased in Jenkins Club. In Early Baart and Pusa, the greatest loaf volume came from wheat receiving nitrogen at planting and in Sonora from wheat receiving nitrogen when about 2 months old. The peculiarities of loaf volume and percentage of protein of the different wheats appeared to correspond rather generally with the varietal peculiarities in response to nitrogen applications at various growth stages.

The conclusion seemed warranted that the strength of flour of any variety of wheat is factorially related to (1) the protein content of the grain and (2) some factor or process connected with a period of development of the plants which is reflected in differences in time of ripening.

Seeds mixture studies: Some Carmarthenshire results, W. DAVIES and A. D. THOMAS (*Welsh Jour. Agr., 3 (1927), pp. 147–151*).—Behavior of different pasture mixtures showed the advisability of seeding only a moderate proportion of the aggressive rye grasses so that they may control weeds and produce forage and yet not suppress other constituents of the mixture. The greater longevity of perennial rye grass enables it to suppress weeds longer than Italian rye grass.

HORTICULTURE

Horticulture [at the Missouri Station], T. J. TALBERT ET AL. (*Missouri Sta. Bul. 244 (1926), pp. 44–46, 47, fig. 1*).—This report as usual (E. S. R., 54, p. 738) is composed of brief progress statements, in part previously noted.

Studies by A. E. Murneek showed partial or complete sterility to be common among apples in some years and that practically all the principal varieties grown in Missouri were benefited by cross-pollination. Observations on cherries showed the Dukes to be self-sterile and the sours, Montmorency, Early Richmond, and

English Morello, to be partially so but interfertile. The degree of sterility in sour cherries was affected by environmental factors. Cyclic sterility in Cleome was completely eliminated by the removal of the seed pods, suggesting that such studies belong to physiology rather than genetics.

In conformity with results previously reported by Lott (E. S. R., 56, p. 644), H. D. Hooker suggests that the percentage of colloidally bound water is a reliable measure of hardiness in brambles, that a fall cover crop combined with an application of nitrogen gives the maximum degree of hardiness, and that the removal of the first two crops of shoots increases hardiness in red raspberries.

Analyses by Hooker and H. G. Swartwout of the shoots and spurs of sour cherries subjected to differential cultural treatments showed that in the spring nitrogen moves in considerable amounts into the spurs and shoot tips. During the winter and early spring sugars decreased and starch increased. After growth started the carbohydrates decreased rapidly.

Studies by J. T. Quinn showed the value of selection for disease resistance in the cabbage and the tomato. The starting of cantaloupes in paper and wooden bands under glass proved practicable for the commercial melon growing districts of southeast Missouri.

[Horticultural investigations at the Porto Rico Station], T. B. McClelland, B. L. Davis, and J. A. Saldaña (*Porto Rico Sta. Rpt. 1925, pp. 5, 11–13, 14, 15, 16, 17, figs. 2*).—Fermentation of the pulpy matter surrounding cacao beans was found to affect in an unfavorable way the development of the aroma. Covering the seeds following fermentation with clay or natural lime apparently neutralized and eliminated the deleterious acids and sealed in the aroma.

Preliminary studies by McClelland upon the effect of varying the period of daylight exposure upon beans and sweet potatoes showed pronounced effects upon growth and blossoming.

In a long continued fertilizer test with coffee complete fertilizer as compared with nitrogen alone gave the better results. Potash alone, and particularly when used with nitrogen, was also effective in increasing yields. Nitrogen in heavy applications without potash affected fruiting adversely, and the trees so treated produced sparse foliage and poor growth. In respect to yield the leading plat among 40 was that receiving nitrogen and potash at the heaviest rate and no phosphoric acid. In pot experiments coffee plants growing in heavy clay fertilized monthly with sodium nitrate supplemented with sulfur ranked first in weight of leaves and woody growth. Little difference was noted between ammonium sulfate and sodium nitrate when both were supplemented with sulfur. Sodium nitrate without sulfur was not equal to the combination, but sulfur alone gave poor results. It was evident that fractional doses of fertilizer were more effective than larger treatments. The results of the coffee experiments were fully discussed in a previous bulletin (E. S. R., 56, p. 345).

With coconuts the variations in yield between trees receiving identical treatment were so large as to confuse results. The results of tests with mangoes, mangosteens, and other fruits are reported.

In sweet corn breeding studies conducted by Davis and Saldaña it was found that selected strains developed from sweet corn kernels found on ears of native corn were superior to selections from hybrids resulting from crosses between native field corn and imported varieties.

[Variety tests at the Rhode Island Station] (*Rhode Island Sta. Rpt. 1926, pp. 40, 41*).—Arranged in the order of earliness are four cantaloupes, Miller Cream, Emerald Gem, Bender Surprise, and Heart of Gold. Red Wethersfield and Yellow Globe onions yielded about equal, with the Japanese Ebenezer a fourth less. In accordance with the preceding season's results (E. S. R., 55,

p. 236), the blue strain of Hubbard squash outyielded the green. Of 9 sweet corn varieties planted May 5 Early Dighton, Early Surprise, and Golden Swift were the first to ripen, August 6. Catawba was the most productive, and Whipple yielded the largest ears. Up to August 12 the Early Sunrise tomato yielded the most ripe fruits of 9 early varieties tested.

Fertilization of truck crops in rotation, W. B. Mack (*Pennsylvania Sta. Bul. 210 (1927), pp. 3–18, 22–31, fig. 1*).—Records taken since 1916 on a series of fertilizer plats upon which is followed a 4-year rotation consisting of early cabbage, early potatoes, tomatoes, and wheat with timothy and clover sown in the wheat have shown as an outstanding feature the uniformly great response of all the crops to phosphorus. At the same time relatively small amounts of nitrogen and potash were necessary to prevent these elements from becoming limiting factors. In the case of potash, however, large applications frequently resulted in losses.

By dividing the series into four sections and beginning each with a different crop each crop was grown annually. An analysis of the data on the cabbage shows the largest increases on the high phosphorus plats, but it was considered doubtful whether the largest application of acid phosphate, 1,250 lbs., reached the maximum usefulness. Both nitrogen and potash produced significant gains when used with one or two of the other principal elements. In respect to size of application, 60 lbs. of nitrogen per acre produced the largest yield, and 40 lbs. of potassium oxide was as effective as larger amounts. Tankage and dried blood produced smaller early and total yields than did calcium nitrate, sodium nitrate, or cyanamide. Ammonium sulfate was about equal to the organic materials and was relatively less useful in a complete fertilizer than when used with acid phosphate alone. Acid phosphate was the best carrier of phosphorus, but raw rock gave good results when judged by total yields. Muriate of potash was apparently slightly better than sulfate in respect to total but not to early yields. Manure, even at 40 tons per acre, produced no better than the complete fertilizer consisting of 60 lbs. of nitrogen, 100 lbs. of phosphoric acid, and 80 lbs. of potassium oxide and was less effective in promoting early yields. Lime showed no significant gains, although an apparent benefit was noted on the ammonium sulfate plats. Different fertilizers caused no measurable variation in the solidity of the heads. Nothing was gained by splitting the standard application of nitrogen into halves, the second of which was applied after the plants were established.

In the case of tomatoes phosphorus carried in acid phosphate was again the most important element. Potash also gave significant gains when used in small amounts, but nitrogen produced no measurable gains, the smallest quantity used producing yields approximating those of larger applications. Inorganic carriers of nitrogen, with the exception of ammonium sulfate, were better than the organic. No difference was observed between muriate and sulfate of potash. Manure, although significantly less effective than complete fertilizer in promoting early yields, gave the maximum yields among all the treatments. Thirty tons was as effective as more. Lime proved of no benefit except in 1923 when streak disease was quite severe on the manured plants. No association was established between the occurrence of rots and fertilizer treatment.

Pollination and life history studies of lettuce (*Lactuca sativa* L.), H. A. Jones (*Hilgardia [California Sta.], 2 (1927), No. 13, pp. 425–479, figs. 110*).—Herein are presented the data obtained in a microscopic study of the various processes in the development, pollination, and postpollination changes in lettuce blossoms. Lettuce flowers were observed to be almost entirely self-pollinated, the pollen being shed before the flower head is fully expanded. Plants showed definite flowering peaks, reaching a maximum in late June followed by a de-

cided drop with another peak coming in early July. The time elapsing between pollination and fertilization was very brief, 6 hours sufficing to complete the process. The variety popularly known as Iceberg was used in the study.

Edible and poisonous fungi ([*Gt. Brit.*] *Min. Agr. and Fisheries, Misc. Pub. 54* (1926), *pp. 29, pls. 25*).—A small handbook designed to aid in the identification of English fungi.

American fruits: Their propagation, cultivation, harvesting, and distribution, S. FRASER (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench, Trübner & Co., 1927, pp. XV+892, figs. 173*).—A manual upon propagation, cultivation, harvesting, marketing, and varieties.

The effect of the source of nursery stock on the growth of apple trees in Minnesota, W. G. BRIERLEY (*Minn. Hort., 55* (1927), *No. 5, pp. 129–137, figs. 2*).—Observations upon Oldenburg, Wealthy, McIntosh, and Jonathan trees obtained from nurseries in Minnesota, Missouri, Alabama, Oregon, New York, and Maryland failed to show any significant differences in vigor or hardiness that could be attributed to source. The Jonathan trees suffered severe winter injury irrespective of origin. Casual observations of the surviving trees would suggest that they were all from the same original lot.

In a second experiment in which Oldenburg trees obtained from Minnesota, Missouri, and Maryland were grown in continuous clean cultivation, a good survival was obtained in all cases except the Missouri lot budded on French crab roots. The author believes that the other two lots owe their resistance to the fact that their grafted roots were planted deeper. Growth, as measured by trunk circumference, was very uniform in all the lots after the first season, indicating that environment rather than source had become the dominant influence. French crab roots are deemed unreliable for Minnesota except when planted deeply.

Blooming seasons of cherries and plums, J. S. SHOEMAKER (*Ohio Sta. Bimo. Bul., 12* (1927), *No. 3, pp. 87–92, figs. 2*).—Based upon 5 years' records taken at Wooster, charts are presented showing in graphical form the average blooming periods for 35 varieties of cherries and 58 varieties of plums. The data are supplemented with notes upon the pollination requirements of plums and cherries.

[Japanese sand pears] (*Jour. Okitsu Hort. Soc., No. 22* (1927), *pp. 1–32, pls. 3; Eng. abs., p. 32*).—A study of Chojuro sand pears collected in 31 districts of Japan showed a marked influence of the temperature of the locality upon the fruit. Pears from cooler locations were more spherical, the stems were longer and more slender, the cavity and basin more shallow, and the core larger than in fruit grown in warmer districts. Trees growing on slopes tended to produce fruit wtih larger stone cells and higher sugar content than did those growing on level areas. The fruits from warm districts contained more cane and less reducing sugars. Fruit of good quality had a total sugar: acid ratio ranging between 85 and 120.

Origin of the garden strawberry, A. J. MANGELSDORF (*Jour. Heredity, 18* (1927), *No. 4, pp. 177–184, figs. 4*).—Evidence is presented to show that the present-day strawberries are hybrids between *Fragaria chiloensis* and *F. virginiana*. These species cross readily, produce fertile hybrids, and have the same haploid chromosome number, 28. It is believed that the present-day strawberry arose in Europe in gardens where the pistillate form of *F. chiloensis* and the hermaphroditic form of *F. virginiana* were grown side by side.

The strawberry and its cultivation in Canada, W. T. MACOUN and M. B. DAVIS (*Canada Dept. Agr. Bul. 80, n. ser.* (1927), *pp. 53, figs. 28*).—This paper, with contributed chapters on insects affecting the strawberry and upon straw-

berry diseases, is a general discussion of strawberry production in Canada, supplemented with results of various investigations.

The story of the banana, compiled and edited by P. K. Reynolds (*Washington: Pan Amer. Union, 1926 pp. 40, figs. 39*).—Popular information is given upon the growing, harvesting, and marketing of this fruit.

Investigations on coffee.—I, Physiological experiments on germination of coffee seed [trans. title], J. Schweizer (*Arch. Koffie Cult. Nederland. Indië, 1 (1927), No. 6, pp. 249–271, pl. 1, figs. 14; Eng. abs., pp. 269, 270*).—Observations upon coffee seeds harvested from a single plant showed considerable variation in viability, the later seeds being the better. No difference in germination was noted between light and heavy seeds nor between normal shaped and round berries. Very small berries germinated better than very large ones but yielded weaker plants. After about 1.5 years all differences due to seed size, etc., had disappeared.

Seeds stored in paraffin oil to prevent drying out lost their viability very rapidly. Attempts to stimulate germination by softening the outer coat failed to yield favorable results. Under certain conditions treatment of old seed with formalin proved beneficial.

Bud selection in the Washington Navel orange, A. D. Shamel, C. S. Pomeroy, and R. E. Caryl (*Jour. Heredity, 18 (1927), No. 3, pp. 135–142, figs. 3*).—Records taken upon progeny trees of two off-shape variations of the Washington Navel orange showed a distinct tendency for the young trees to produce fruit like that of the parent limbs. There was, however, a considerable quantity of normal fruits produced in each instance, indicating an instability in respect to the inheritance of shape. The rind, flesh, and juice of the fruits from the progeny trees were like those of the fruit of the parental limbs.

Relation between fruit size and abscission of young orange fruits, A. R. C. Haas (*Bot. Gaz., 83 (1927), No. 3, pp. 307–313*).—The much greater dropping of small than of large sized oranges from trees growing at the Citrus Experiment Station, Riverside, Calif., is believed by the author to be due largely to the decrease in proportionate area as fruits increase in diameter and not to any differences in stomatal regulation or in the nature of the rind. In laboratory tests the percentage loss of moisture from young oranges and grapefruits decreased rapidly as the fruits increased in size. In the orchard it was noted that young citrus fruits dropped readily up to a certain size and rarely thereafter. From a practical viewpoint any fertilizer or cultural treatment that might hasten the sizing of the young fruits should give them a better opportunity to remain attached to the tree during periods of excessive heat.

Pollination experiments with the filbert [trans. title], E. Johansson (*Meddel. Perm. Kom. Fruktodlingsförsök [Sweden], No. 11 (1927), pp. 18; Eng. abs., pp. 16, 17*).—Self-sterility noted in certain filbert varieties was increased by a paucity of male catkins and a tendency for these to be injured during the long winter period. No significant differences of time were noted between the appearance of the stigmas in the female catkins and the shedding of pollen from the males within any single variety. Female catkins were very resistant to cold, enduring −14° C. (7° F.). The removal of from 1 to 2 mm. of the protruding pistil failed to prevent fruit setting, indicating a physical ability to overcome frost injury.

Most of the varieties studied gave 90 per cent or more germination of pollen in 20 per cent cane sugar solution. Pollen germination was not reduced by the exposure of catkins to −14° C. in March. The Cosford variety developed pollen tubes at from 36 to 37° F., although at a slow rate. Der Schah pollen survived but did not grow in a sugar solution at 32°. Pollen in catkins stored at room temperature completely lost viability in about 17 days.

Studies over a period of 3 years showed most varieties to be nearly self-sterile, thus corroborating the results of Schuster in Oregon (E. S. R., 52, p. 238). Cosford was the only effective self-polliniser. Good results were obtained when Längliche Riesennuss, Tidig lång Zeller, and Géant de Halle were pollinated with pollen from *Corylus avellana*. No fruit was secured when Apolda, Cosford, and Multiflorum were pollinated by *Corylus colurna*.

The morphological differentiation of the pistillate flowers of the pecan, D. V. SHUHART (*Jour. Agr. Research [U. S.], 34 (1927), No. 7, pp. 687–696, pls. 6, figs. 5*).—A microscopic examination of pecan buds collected at weekly intervals beginning in September showed no observable differentiation in the pistillate flowers until after growth had started in the spring. Some differences were noted between varieties, but these were not as great as those caused by variation in the location of the trees of a single variety. Four distinctly different types of terminal buds were observed in bearing pecans, only one of which was found to be a true terminal bud. The three other types, designated as false terminal buds, are described and illustrated. It was found that fruiting branches as a rule do not originate from lateral buds which are more than 2 in. from the terminal, regardless of its type. Not more than three pistillate buds normally developed on any one shoot. The rate of development of pistillate flowers was much slower than that of the leaves on the same shoot.

The formation and development of the pistillate flowers of the pecan, D. V. SHUHART (*Oklahoma Sta. Bul. 163 (1927), pp. 7, figs. 2*).—A popular presentation of material noted above, in which is discussed the type and structure of the terminal buds of the pecan. Information is given on the time of differentiation of the pistillate blossoms.

Distance pecan pollen is carried by the wind, J. G. and N. C. WOODROOF (*Amer. Nut Jour., 26 (1927), No. 6, p. 85*).—Investigations at the Georgia Experiment Station showed that pecan pollen is disseminated almost entirely by the wind, and may under favorable circumstances be carried at least 1,000 ft. in adequate quantities to insure pollination. Generally the most rapid shedding of pollen occurred from noon until 3 p. m. On dry days pollen was collected in the air until after sundown. Heavy, damp weather prevented the dissemination of pollen almost completely. Various commercial varieties are grouped according to the period of pollen shedding into two distinct lots between which there occurred an interim of approximately 10 days. As a practical deduction the authors suggest that pecan trees be planted within 500 ft. of those designed to serve as pollinizers.

The book of bulbs, F. F. ROCKWELL (*New York: Macmillan Co., 1927, pp. XX+264, pls. 31, figs. 29*).—Practical information is given upon the selection of varieties, culture, and utilization of the common bulbous plants, the narcissus, gladiolus, dahlia, iris, peony, etc.

The dahlia book, edited by K. FOERSTER and C. SCHNEIDER (*Das Dahlienbuch. Berlin: Gartenschönheit, 1927, pp. 103, figs. 78*).—A comprehensive discussion, illustrated partly in color, upon the dahlia, its development, propagation, culture, varieties, etc.

The dwarf bearded iris, I, A. H. and A. A. WRIGHT (*New York Cornell Sta. [Pamphlet], 1927, pp. 12*).—A preliminary working list of varieties based upon a study of the literature and published with a view of aiding iris growers and of indicating varieties which are desired for testing.

Foundation planting, L. H. JOHNSON (*New York: A. T. De La Mare Co., 1927, pp. XVIII+236, pl. 1, figs. 280*).—Profusely illustrated, this book presents suggestions upon the use of plant materials about homes and other buildings, including the culture, pruning, and fertilizing of shrubs and evergreens.

FORESTRY

The natural replacement of blight-killed chestnut in the hardwood forests of the northeast, C. F. KORSTIAN and P. W. STICKEL (*Jour. Agr. Research [U. S.], 34 (1927), No. 7, pp. 631–648, figs. 9*).—Studies in southern New England, New Jersey, and Pennsylvania upon forest areas in which chestnut was the dominating species prior to its destruction by blight showed abundant replacement reproduction on all except the poorest quality sites. On good sites in southern New England the number of seedlings and sprouts was found far larger than could possibly survive, and the percentage of desirable species was large, indicating that the chestnut is being satisfactorily replaced. Red, white, chestnut, black, and scarlet oak species occupied a prominent position in the reproduction. An outstanding feature is the increase of red and chestnut oak, both in the number of trees and in basal area. Other desirable species, hickory, ash, sugar maple, and sweet birch, were often associated with oak. The data showed that trees remaining after the death of the chestnut have benefited by the release and through stimulated crown growth are fast closing the smaller openings.

Bamboo against staghorn fern, C. S. JUDD (*Hawaii. Forester and Agr., 24 (1927), No. 2, pp. 54, 55, figs. 2*).—A brief account of the successful eradication of the undesirable creeping fern by bamboo.

General biology of the flowers, fruits, and young regeneration of the more important species of the Knysna forests, J. F. V. PHILLIPS (*So. African Jour. Sci., 23 (1926), pp. 366–417*).—Phenological data are given on 63 species of trees and shrubs, citing remarkable variations in the time and habits of flowering within certain of the species.

A review of the species of Populus introduced into South Africa, C. S. HUBBARD (*So. African Jour. Sci., 23 (1926), pp. 340–365, pls. 2*).—This paper contains a description of species and a discussion of methods of propagation and general silvicultural practices.

Pinus patula, Schl. and Cham.: Its introduction into and growth in South Africa, J. J. KOTZE (*So. African Jour. Sci., 23 (1926), pp. 455–466, pls. 3*).—Brief observations are given upon the distribution, behavior in various localities, and habits of growth and of reproduction in *P. patula*, a promising species introduced into South Africa from Mexico.

The propagation of "stinkwood" (Ocotea bullata E. Mey.) by vegetative means, J. F. V. PHILLIPS (*So. African Jour. Sci., 23 (1926), pp. 418–434*).—An account of ineffectual attempts to propagate vegetatively a desirable South African timber tree, the low viability of whose seeds prevents ready reproduction. Of approximately 10,000 cuttings planted in the forest under various conditions only 0.21 per cent developed callus and roots, and of these none lived more than a few months. In nurseries the best success, about 1 per cent, was with cuttings in sand and heavily shaded. Good callusing and budding were obtained in the case of cuttings buried in sand, but only 2 per cent survived when placed in the nursery. Similar results were obtained with cuttings under inverted jars.

Watering cuttings with dilute acids, acetic, citric, hydrochloric, and sulfuric, mildly favored callusing, the best results, 5 per cent, being obtained with a 1:10,000 acetic acid solution. Distilled water brought to a pH value of 5.5 by passing carbon dioxide through also stimulated callusing. Alkaline cultures on the other hand proved detrimental. Cuttings in nutrient solution rooted better than those in distilled water.

Shoots etiolated while still attached by covering with bags lined with black cloth gave an unusually high percentage of callusing, but the resulting plants

were too delicate to survive. Etiolation caused a decrease in the starch and an increase in the nitrate content. Attempts to root detached leaves and to use short-stem cuttings with a single eye met with little success. In the case of root cuttings, about 10 per cent formed new roots, but the resulting plants were decidedly weak. With large thick cuttings 4 to 8 ft. in length not a single one formed roots. The author concludes that vegetative propagation of *O. bullata* is not practical.

The forests of Indo-China, H. Lecomte (*Les Bois de l'Indochine. Paris: Agence Économique de l'Indochine, 1925, pp. IV+311+4, pls. 86, figs. 33*).—This general treatise consists largely of technical descriptions of the species. An appendix by H. Guibier is included.

DISEASES OF PLANTS

The romance of the fungus world, R. T. and F. W. Rolfe (*London: Chapman & Hall, 1925, pp. XX+309, pls. 31, figs. 23*).—Following a foreword by J. Ramsbottom, the several chapters of this book, intermingled with presentation and discussion of historical and literary fragments, deal with some scientific and practical aspects of fungi as furnishing food or delicacies or as injuriously affecting cultivated plants.

The smut and rust fungi, W. Migula (*Die Brand- u. Rostpilze. Stuttgart: Franckh'sche Verlagshdlg. [1925], pp. 111, pls. 8*).—This book, No. 13 in a series of handbooks for practical work in natural science, is intended to serve as a help in the recognition, designation, collection, and preparation of smut and rust fungi. Of the several sections, the first deals very briefly with the collection, study, and preparation of material, the second less briefly with life histories, and the third in systematic detail with the various forms and their classification.

Studies on Botrytis, G. H. Berkeley (*Roy. Canad. Inst. Trans., 15 (1924), pt. 1, pp. 83–127, pls. 6, figs. 17*).—"In spite of the attention this genus has received, it is still, from the systematic standpoint, in an exceedingly confused state, so great, indeed, that we can not be certain of the identity of many of the forms on which important critical studies have been based. . . . The four strains [referred to throughout as Botrytis I, IV, VII, and IX] used in this investigation were isolated early in 1920 from different hosts growing in widely separated localities. . . . As shown by the different types of growth on the living hosts after infection had taken place, these four Botrytis forms fall into two groups with Botrytis IX and IV in one group and Botrytis VII and I in the other. A correlation between the grouping obtained from the metabolism studies with the grouping from the cultural, spore germination, and host inoculation experiments has been demonstrated."

Cladosporium fulvum, R. C. Spangler (*Bot. Gaz., 78 (1924), No. 3, pp. 349–352, figs. 9*).—From this investigation it is considered as certain that Cladosporium and Hormodendron are one and the same fungus.

The sensitivity of Phaseolus vulgaris for strains of Colletotrichum lindemuthianum [trans. title], K. Böning (*Forsch. Geb. Pflanzenkrank. u. Immunität Pflanzenr. No. 2 (1926), pp. 1–18*).—Citing data from work done in connection with Schaffnit (E. S. R., 55, p. 652) and by others about the same time, the author gives information regarding further experimentation dealing with varietal forms of the fungus *C. lindemuthianum*.

The developmental history and sexual physiology of Ustilago bromivora and U. grandis. [trans. title], R. Bauch (*Ztschr. Bot., 17 (1925), No. 3, pp. 129–177, figs. 4*).—These studies were carried out during the period from September, 1922, to September, 1924. A bibliography is furnished.

***Verticillium* disease** [trans. title], J. H. H. van der Meer (*Tijdschr. Plantenziekten. 31 (1925), No. 3, pp. 59–74, pls. 8*).—Tests are outlined as made with herbaceous and woody plants under inoculation with *V. albo-atrum* and *V. dahliae*. It appears that Verticillium can saprophytically pass through severe conditions of drought or cold without losing its virulence for its hosts, in part economic plants.

Plant diseases and their control in relation to climatic conditions in Delaware, J. F. Adams (*Peninsula Hort. Soc.* [*Del.*] *Trans., 39 (1925), pp. 39–43*).—An account of rainfall and temperature for each month of 1924 and 1925 at Bridgeville and at Dover is discussed in connection with disease prevalence in various plants.

A study of certain fusarial diseases of plants [and] miscellaneous investigations, I. T. Scott (*Missouri Sta. Bul. 244 (1926), pp. 30–32*).—In pursuance of investigations related to those previously noted (E. S. R., 54, pp. 321, 774), the author studied the effect of mycelium of *Fusarium lycopersici* upon the reaction of both buffered and unbuffered single-salt solutions at different H-ion concentrations. A somewhat detailed account of the results of this work has been given (E. S. R., 56, p. 542).

In continuation of the investigation (E. S. R., 54, p. 744) of wheat varietal resistance to scab (*Gibberella saubinetii*), 29 strains and varieties of wheat were studied. It is believed that the resistance and susceptibility observed stand relatively about as in the previous seasons. Red May shows marked resistance, noteworthy station selections being W203, W210, and W214, with infection amounting to only 0.28, 0.37, and 0.18 per cent, respectively. Poole C. I. 5653 (W174) showed only 0.18 per cent infection, this latter strain during three years' trials having given an average infection of only 0.47 per cent. The Turkey-Kanred strains and most of the Mediteranneau group continued to show relatively high infection.

In alfalfa Fusarium blight studies further species of the fungus were isolated, but apparently none that had not been previously reported.

Alfalfa bacterial blight causes losses sometimes amounting to 70 per cent of the crop. The disease causes a dry rot zone about 1 in. wide at the crown. Small brownish areas yield more numerous bacteria in every case.

Apple canker, due to *Cytospora* sp. (*Valsa leucostoma*?), is becoming serious in some widely separated orchards. The die-back apparently attacks only weakened trees, particularly those suffering from winter injury, root rots, or constitutional diseases. Parasitic fungi producing root rots may constitute the primary cause.

Report of the plant pathologist, C. M. Tucker (*Porto Rico Sta. Rpt. 1925, pp. 24–40, figs. 7*).—In a continuation of reports previously noted (E. S. R., 50, p. 547; 51, p. 847; 54, p. 648), accounts are given, in some detail, regarding coconut palm bud rot (*Phytophthora* (*faberi*) *palmivora*) (E. S. R., 55, p. 150); lightning injury to coconut palms; a root disease of vanilla (*Fusarium* sp.); the cotton spotting fungus (*Helminthosporium gossypii*) (E. S. R., 54, p. 846); strains of tropical Phytophthoras in various tropical plants; a pigeon pea seedling parasite (*Rhizoctonia ferrugena*), anthracnose (*Colletotrichum cajani*) (E. S. R., 57, p. 349), and stem canker (*Botryosphaeria xanthocephala*); a sisal physiological disease; tomato wilt (*Bacterium solanacearum*) and nematode root knot; and hibiscus root rot (*Pythium* sp.?). A large number of miscellaneous plant diseases are more briefly dealt with.

[Plant disease investigations in British Guiana], R. A. Altson (*Brit. Guiana Dept. Sci. and Agr. Rpt. 1925, pp. 39–43*).—This portion of the mycology report outlines information regarding sugar cane root diseases (*Marasmius sacchari*, *Melanconium sacchari*, *Pythium* sp. and *Rhizoctonia* sp.), top rot,

chlorosis, and other diseases associated with *Leptosphaeria sacchari*, *Cercospora vaginae*, *Thielaviopsis paradoxa*, and *Stemonitis herbatica*; cacao witch-broom disease (*Marasmius perniciosus*) and pod rot (*Phytophthora faberi*); coconut wilt (*Phytophthora* (?) sp.); and coffee wilt disease (*Papulospora* (?) sp.).

[Plant diseases in Ireland], F. J. Meyrick (*Ireland Dept. Agr. and Tech. Instr., Ann. Gen. Rpt., 23 (1922–23), pp. 62, 63*).—Brief reference is made to work done with potato virus diseases, showing that the presence of leaf roll or mosaic causes no breaking down of immunity to potato wart disease (black scab) in varieties grown in Ireland; to potato blight experiments; to onion mildew mycelium hibernation investigations; to studies on wheat stem break disease; and to minor investigations involving *Phytophthora syringae* and *P. parasitica* on different plants.

[Plant diseases, Gambia Colony, 1925], A. J. Brooks (*Gambia Dept. Agr. Ann. Rpt. 1925, p. 11*).—Lightness of rainfall is thought to be influential in the reduction of peanut leaf spot disease observed. Rosette appeared in as large a proportion as 78 per cent of the plants arising from seed left in the ground by harvest operations, even on plats showing no disease during the growing season. It is inferred that the supposed insect carriers are more active and more plentiful during the dry season (November–May) than during the wet season (June–October). The director's observations confirm the view that the disease is not transmitted by seed, soil, water, or wind, but that it is carried by a sucking insect. The first and chief line of defense is thought to be the destruction of all peanut plants found growing between December and May.

Work connected with insect and fungus pests and their control, C. W. Line (*Gambia Dept. Agr. Ann. Rpt. 1925, pp. 34, 35*).—Peanut rosette, due to a virus, apparently is not carried in the seed. It has been shown to be transmitted by *Aphis leguminosae* Theo., though tests with jassids and fulgorids gave negative results. The mode of overwintering has not been discovered.

Peanut leaf spot (*Cercospora personata*), though prevalent throughout Gambia, caused less damage than in former years. Several new varieties, introduced on account of supposed resistance to the leaf spot fungus, have already shown promising results.

A sporadic smut of suno is described as causing a darkening of the flour. The spores retain germinability for at least two years. Seed treatment with formalin, though effective, is not necessary if the heads showing the darkening grains are removed and rotation is practiced. Malformation of the green ear caused by *Sclerospora graminicola* is not yet serious in Gambia.

Gold Coast plant diseases, R. H. Bunting and H. A. Dade (*London: Waterlow & Sons [1925], pp. VII+9–124, pls. 25*).—This is regarded by the authors as an initial work of a general nature on the subject of plant diseases in the Gold Coast.

Report of mycologist [Kenya], J. McDonald (*Kenya Colony Dept. Agr. Ann. Rpt. 1925, pp. 141–148*).—This report, prefaced by a general account of routine and investigational work related to plant diseases, lists, as noted or definitely identified for the first time in 1925, coffee seedling blight (*Rhizoctonia solani*—confirmed) and mealybug root disease (fungus not determined); maize head smut (*Sorosporium reilianum*), ear rot (*Gibberella saubinetii*), and streak disease; sugar cane mosaic; tea brown blight (*Colletotrichum camelliae*) and scab (physiological); sorghum head smut (*S. reilianum*), rust (*Puccinia purpurea*), and smut (*Sphacelotheca sorghi*); bulrush millet (*Pennisetum typhoideum*) green ear disease (? *Sclerospora graminicola*); peanut leaf spot (*Cercospora personata*); alfalfa anthracnose (*Colletotrichum trifolii*); beet leaf

blight (*Cercospora beticola*); bean leaf disease (*Isariopsis griseola*); *Podocarpus gracilior* leaf disease (*Corynelia clavata*); (*Cynodon dactylon* smut (*Ustilago cynodontis*) and inflorescence disease (*Cerebella cynodontis*); *Solanum* sp. leaf disease (*Aecidium solani-unguiculati*); and *Wedelia* sp. [disease] (*Tuberculina persicina*); and a parasite on pustules of maize and sorghum rusts (*Darluca filum*).

Coffee pink disease and berry disease were found at Kericho in 1925. Of the newly reported diseases the most noteworthy was sugar cane mosaic. Maize head smut, newly reported, is destructive and relatively difficult to control. An injurious coffee leaf disease (*Hemileia vastatrix*) occurred at Koru. Wheat stem black rust (*Puccinia graminis*) caused severe loss in places.

A preliminary census of the plant diseases of south Western Australia, W. M. CARNE (*Jour. Roy. Soc. West. Aust., 11 (1924–25), pp. 43–68*).—The present paper is an attempt to bring together previously printed records of the occurrence of plant diseases in that portion of Western Australia which is called Swanland in this paper, with accounts also of a number not previously made known through publication, and with a bibliography covering 1878–1925. It is stated that the most comprehensive list of diseases recorded as occurring in Western Australia to date is that in D. McAlpine's Systematic Arrangement of Australian Fungi, 1895. Briefly stated, plants in Western Australia are liable to parasitic diseases mainly in the wet season and to nonparasitic diseases chiefly in the dry season.

Influence of form and proportion of lime used and of method of mixing on the resulting Bordeaux mixture, E. B. HOLLAND, C. O. DUNBAR, and G. M. GILLIGAN (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 7, pp. 677–686*).—Tests at the Massachusetts Experiment Station of four forms of lime employed with copper sulfate and water in preparing Bordeaux and allied mixtures are said to have shown that the activity varies directly as the degree of dispersion and decreases in the order of the relative quantities indicated, namely, limewater (0.538 gm.–0.109 gm.–100 cc.), precipitated lime (4 lbs.–1.50 lbs.–50 gal.), milk of lime (4 lbs.–2.00 or 2.25 lbs.–50 gal.), and hydrated lime (4 lbs.–2.00 lbs.–50 gal.). The best mixing method is that of pouring dilute copper sulfate into concentrated lime, or the two simultaneously into a third receptacle. Some of the better grades of hydrated lime are promising substitutes for milk of lime, but require soaking before being used.

June experiments at Arlington experimental turf garden with chlorophenol mercury compounds (Semesan and Uspulun), O. B. FITTS (*Bul. Green Sect. U. S. Golf Assoc., 5 (1925), No. 7, pp. 147, 148*).—Brown patch appeared early at Arlington, Boston, and St. Louis. Small brown patch appeared at Arlington on susceptible strains of bent grass, but in the case of the earlier outbreaks recovery occurred without treatment. The treatments for large brown patch which had shown evidence of effectiveness (E. S. R., 57, p. 345) were the mercury chlorophenol preparations, Bordeaux mixture, and top-dressing with compost and ammonium sulfate. Watering in the early morning lessened the injury from the disease. Bordeaux mixture does not appear to prevent small brown patch. Light applications of mercury chlorophenol gave better results than did heavy applications, with less burning effect. Dusting appeared to burn the grass more than sprinkling or spraying. A top dressing of compost is recommended, to be applied at the rate of 1 cu. yd. to 5,000 sq. ft. with the addition of 15 lbs. of ammonium sulfate or phosphate, as this treatment hastens the recovery of the grass from the disease or from burning due to fungicides.

Investigations on the stripe disease of barley [trans. title], K. DE HAAN (*Tijdschr. Plantenziekten, 32 (1926), No. 8, pp. 45–56; Eng. abs., pp. 55, 56*).—

Investigations have not proved that *Helminthosporium gramineum* forms perithecia. Sclerotia had been observed only in pure culture until the author established the occurrence of sclerotia on dead barley plants. In pure culture they were found on drying media. The identity of the sclerotia found in nature was proved by artificial inoculation on germinating barley seed and examination of the resulting mycelium.

Conidia occurred in a roll culture of water agar kept in darkness until they dried, and they were found at the end of one year. Inoculations of barley were secured in 24 per cent of the cases tested. Varieties showed wide differences in susceptibility.

Barley covered smut [trans. title], L. Rump (*Forsch. Geb. Pflanzenkrank. u. Immunität Pflanzenr. No. 2 (1926), pp. 19–76, pls. 5, figs. 9*).—Morphology, cytology, and host and other relations are dealt with in a study of *Ustilago hordei*, the cause of barley covered smut.

Relation of internal cob discoloration to yield in corn, R. A. Jehle, F. W. Oldenburg, and C. E. Temple (*Phytopathology, 16 (1926), No. 3, pp. 207–215, figs. 2*).—The results of 90 tests over four years are said to show that the discoloration-free cobs carry more grain than do those showing discoloration. This difference is accentuated on the poorer corn soil. Higher yields correspond to slighter internal discolorations. Cob discoloration can be decreased by selection, and has been almost completely eliminated in four years. Internal cob discoloration is correlated positively with fallen or broken stalks and prematurely killed plants, negatively with uniformity of stand.

The relation of internal cob-discoloration to yield in corn: Five years' results, R. A. Jehle, F. W. Oldenburg, and C. E. Temple (*Maryland Sta. Bul. 290 (1927), pp. 178–196, figs. 6*).—The conclusions in this report, following the fifth year of this work and employing 117 plats, are identical with those briefly noted above.

Field experiments with seed corn treatments and crop stimulants, T. A. Kiesselbach (*Nebraska Sta. Bul. 218 (1927), pp. 15, figs. 2*).—Only in the case of small grains infected with covered smuts was seed treatment of Nebraska grown crops beneficial in tests at the station during 1924–1926. The seed used represented varieties of corn, winter wheat, oats, and barley adapted to the locality and planted in accordance with usual farm practice.

The organic mercury disinfectants Uspulun, Semesan, and Bayer Dust when applied to ordinary seed corn showed no signficant effect upon germination, stand, seedling growth rate, crop vigor, smut percentage, barrenness, lodging, acre yield, or quality of product. Worm damage was probably not reduced.

It is suggested that favorable response from these treatments may be expected primarily with Diplodia-infected and Gibberella-infected seed, but that these are not serious factors as seed-borne diseases in the corn production in the State. There was no sign of damage by seed-borne diseases to corn grown from either treated or untreated seed under the conditions of these experiments. Uspulun and the standard treatments, copper carbonate and formalin, have proved effective in the control of stinking smut of wheat. As crop stimulants, these organic mercury compounds showed no material effect upon the growth or yield of healthy wheat, oats, barley, or corn.

Barberry eradication and sources of black stem rust in Colorado, L. W. Durrell and E. A. Lungren (*Colorado Sta. [Bul.] 325 (1927), pp. 18, figs. 10*).—Black stem rust (*Puccinia graminis tritici*) in Colorado overwinters in the black-rust stage on wheat stems, on stubble, or on wild grasses, reinfecting the grain crop after passing through the stage on the common barberry (*Berberis vulgaris*). This plant is said to be the chief source of initial stem rust in Colorado, though the somewhat less prevalent but closely related wild bar-

berry (*B. fendleri*) also spreads the rust. Eradication measures are outlined. Destruction of the barberry delays the outbreak about two weeks, allowing the crop to mature before the rust coming in from States to the east and southeast reaches its maximum development.

Studies during five years on stem rust show that on wild barley the urediniospores germinate until late spring, but no natural infection or spread has been traced to this source.

Studies on the susceptibility of summer wheat to Ustilago tritici and the influence of external conditions [trans. title], A. TIEMANN (*Kühn Arch., 9 (1925), pp. 405–467, fig. 1*).—Smut (*U. tritici*), as resting mycelium in grain, may retain viability for at least three years. Seeding late in the season, so far as this involves high temperatures, favors loose smut infection. Nitrogenous fertilizers, except when these produced one-sided overmanuring, lessened rather than increased smut infection. Careful sorting of seeds according to size may lessen loose smut attack.

Use copper carbonate dust to control stinking smut of wheat, L. W. DURRELL and W. KIDDER (*Through the Leaves, 13 (1925), No. 9, pp. 392–394, figs. 2*).—The advantages of the copper carbonate dust treatment include safety, ease, quickness, and freedom from swelling, sprouting, and heating. A barrel and a box type of duster are shown.

Copper treatment for stinking smut [trans. title], M. HOLLRUNG (*Kühn Arch., 9 (1925), pp. 79–96*).—As a result of studies here detailed in regard to various fungicidal preparations, their employment and their effects, the author recommends ammoniacal copper sulfate solution as a seed treatment against wheat stinking smut.

Endive rust and chicory rust [trans. title], J. BOTKE (*Tijdschr. Plantenziekten, 31 (1925), No. 12, pp. 251–258, figs. 2*).—Endive rust and chicory rust were studied as to biological phases and characters, and the causal organisms are herein distinguished as *Puccinia endiviae* and *P. cichorii*, respectively.

Potato diseases in Italy [trans. title], C. ARNAUDI (*Atti Ist. Bot. R. Univ. Pavia, 3. ser., 1 (1924), pp. 72–75*).—This is a preliminary note dealing with potato production in Italy and disease factors, including a number of fungi, which are named.

The relation of leaf and other diseases of the potato to the crop, D. C. CUTHBERTSON (*Jour. Roy. Hort. Soc., 50 (1925), No. 1, pp. 21–27, pls. 10*).—This paper is divided into three sections, the first dealing with the leaf diseases—leaf roll and mosaic; the second with the tuber diseases—blight, wart, corky scab, common scab, Rhizoctonia, and sprain; and the third with the so-called wildings or degeneration types of the plants, regarding which it has not been decided whether they are produced by disease or whether they are degenerate, worthless reversions to wild types of *Solanum tuberosum*.

Leaf roll and mosaic outbreak in isolated, apparently sound stocks [trans. title], J. G. O. BOTJES (*Tijdschr. Plantenziekten, 31 (1925), No. 1, pp. 1–6*).—It not infrequently happens that potato plants appearing sound and growing at a great distance from plants affected with leaf roll or mosaic show a considerable percentage of these diseases in their progenies. The infection is thought to have been transferred to the leaves through the agency of insects. The author is inclined to believe that the infective material may originate in nonsolanaceous mosaic plants.

Potato late blight [trans. title], PAGLIANO (*Bul. Soc. Hort. Tunisie, 23 (1925), Nos. 202, pp. 107–109; 203, pp. 123–129, figs. 2*).—This account of potato late blight (*Phytophtora infestans*) is historical and biological in character.

Black scab in potatoes, E. M. ARCHDALE (*North. Ireland Min. Agr. Ann. Rpt., 4 (1924–25), pp. 84–87*).—Arran Victory is said to be increasingly favored

by growers in Northern Ireland. Other potato varieties were tested for resistance to black wart. The relative total acreages of potato areas planted with varieties immune to black wart during 1923, 1924, and 1925 are placed at 33, 40, and 48 per cent, respectively.

Increase of Rhizoctonia in potato after-culture due to the use of stable manure [trans. title], J. C. DORST (*Tijdschr. Plantenziekten, 31 (1925), No. 5, pp. 115–118*).—Though no increase of Rhizoctonia infection resulted from the first year's employment of stable manure on potatoes, the second year's progeny of these plants showed a considerable increase of Rhizoctonia disease.

Varietal susceptibility of potatoes to wart in 1922–24 [trans. title], J. O. BOTJES (*Tijdschr. Plantenziekten, 31 (1925), No. 2, pp. 31–35*).—In extensive tabular and descriptive detail, the author presents this account of susceptibility of potato varieties to wart disease (*Synchytrium endobioticum*) during 1923 and 1924, the experimentation being conducted in part on different soils.

The scientific breeding of wart-immune potato strains [trans. title], S. J. WELLENSIEK (*Tijdschr. Plantenziekten, 31 (1925), No. 4, pp. 91–101*).—A compactly detailed account of the breeding of potatoes for wart-disease resistance, giving 12 references to related literature.

Soil acidity: Its relation to root-rot, W. T. MCGEORGE (*Hawaii Univ., Ann. Short Course Pineapple Prod., 2 (1924), pp. 40–46*).—During a study of the factors associated with the sugar cane root rot or "Lahaina disease" in Hawaii a casual survey indicated that the root rot is probably not the result of the same factor or factors in all cases. The presence of certain acid salts in Hawaiian soils has been established, and their effects have been studied. Manganese salts affect cane leaves somewhat, but apparently not the roots. Iron as a factor is practically negligible except, perhaps, in poorly aerated soil types where ferrous forms are present. In the presence of aluminum, sugar cane roots first show distress by a curled or fishhooked appearance of the root tips. Later, the root hairs weaken, rot, and fall away. Though the actual toxicity of aluminum has not been definitely proved, it is now certain that pineapple wilt is widely prevalent on acid soils in which aluminum and manganese salts have been found in abundance. Among such districts may be mentioned Kapaa, Kauai, and the Kaneohe district on Oahu.

The correction of aluminum toxicity in acid soils is a matter of very simple procedure, although in some cases not economical. In some cases response was not obtained with liming or with phosphate, but was obtained after satisfying also a potash deficiency. Where the plant is properly nourished, aluminum seems to have little or no toxic effect. Phosphate applications have given remarkable stimulation of root and top growth. Lime, though less effective, is being further studied as possibly the most economical solution of the problem.

It is believed that the pineapple wilt problem is due to a number of factors acting separately or in combination. Aluminum and manganese may be the principal contributory factors on all pineapple soils with a pH value lower than 5.8, and an extensive acreage is planted on such types of soil.

Infection tests with Rhizoctonia and Moniliopsis on tomato and potato [trans. title], S. J. WELLENSIEK (*Tijdschr. Plantenziekten, 31 (1925), No. 11, pp. 235–250, pl. 1*).—Tomato and potato were tested with *R. solani* and with *M. aderholdii*.

Experiments on the cultivation of the active agent of mosaic disease in tobacco and tomato plants, P. K. OLITSKY (*Jour. Expt. Med., 41 (1925), No. 1, pp. 129–136*).—Examination of the extensive literature which has accumulated since the first description of mosaic in tobacco, credited to A. Mayer and dated 1886, showed views so various or conflicting that the author carried

out the present work. This work is believed to show that the incitant to mosaic disease of tobacco and tomato is a living, multiplying body, capable of propagation (cultivation) through many generations in an artificial medium. The agent in the tissues of affected plants may induce the disease in a dilution of 1:10,000, but rarely at higher dilution. During transference from tube to tube of the special medium used, it underwent a dilution far beyond these effective limits—in one experiment to 4×10^{-16}. Nevertheless, the material of the remote subplants proved effective in inducing the disease, which appeared as rapidly and in as active a form as if the undiluted inoculum had been employed. Material from plants in which mosaic developed as a result of inoculation with the culture fluid induced the disease in yet other plants, and from these again the agent could be propagated in vitro, or transfers to other plants could be made. It was noted that the agent present in remote subplants which can induce the disease was not readily filtrable. The nature of the change thus indicated remains to be determined. No formed elements could be distinguished in the medium.

The conclusion is considered justified that the incitant of mosaic disease of tobacco and tomatoes is a living, microbic body which can be cultivated in an artificial medium.

The silver leaf diseases of fruit trees and their cure, Z. I. SOLOMIDES (*Isleworth, Eng.: Holme Court, [1925], pp. 16, pls. 2*).—The silvering which is supposedly characteristic of so-called silver leaf disease, so destructive, particularly among stone-fruit trees, and hitherto usually ascribed to *Stereum purpureum*, is alleged by the author to be merely a symptom of the latest stage of the fungus *Exoascus deformans*. The author considers it important to differentiate sharply between the two distinct forms of manifestation, here discussed, and he proposes, therefore, to give the name *E. deformans endovolus gummiferous* to the silver leaf variant. Another factor may be the very advanced second stage of the bacterial gummosis phase.

Solomia is recommended as an efficient spray for either the prevention or cure of the so-called silver leaf diseases.

Diseases of fruit trees [trans. title], PAGLIANO (*Bul. Soc. Hort. Tunisie, 23 (1925), No. 207, pp. 187–190*).—A brief and rather general account is given of diseases affecting stone and seed fruits, naming the causal organisms.

New methods of bitter rot control, R. H. HURT and F. J. SCHNEIDERHAN (*Virginia Sta. Bul. 254 (1927), pp. 22, figs. 7*).—The data herein reported as resulting from experimentation and observation during three seasons at Crozet and at Winchester are intended to serve as a basis for apple bitter rot control practice in all sections of the State. The fungus, *Glomerella cingulata*, one of the most serious problems of southern apple growers, especially in connection with the susceptible Pippins in the Piedmont Section, was in 1926 first found to overwinter in twigs and in twigs only of the Smokehouse variety. Fruit mummies are by far the most important means of harboring the fungus, and they appear to be the sole means of overwintering in the Albemarle Pippin. The fungus may remain infectious for two years or more in the mummies, each of which spreads the disease in a cone-shaped space below. Secondary infection results from the drip and splash during rains. During 1923–1925 there was an average of 13 days per year favorable to bitter rot infection, with intervals averaging 5 days. Mummies produced spores during a period of 87 days in 1925 and 72 days in 1926. Rain is requisite for the liberation of spores. The minimum time for the accomplishment of infection after inoculation is about 5 hours. A 10-hour period was necessary for heavy infection in the laboratory.

The control of bitter rot is easily accomplished through the application of 3-5-50 Bordeaux mixture for the 5 and 7 weeks spray, if supplemented by suit-

able eradication measures. Mummies may be readily removed by the use of a curved nail in the end of a 10-ft. pole, and the infected fruits by the use of a pole picker.

Black spot control, P. H. THOMAS (*Tasmania Dept. Agr. Bul. 116 (1925), pp. 6*).—Owing to the prevalence of abnormal rainfall in Tasmania, Victoria, South Australia, and New South Wales, the situation as regards apple black spot (*Venturia inaequalis*) has become acute over these areas. The history, development, and relations of this disease are discussed, along with varietal susceptibility and control measures, of which the destruction of dead leaves from the preceding season is regarded as the surest when adequately done, but which is difficult to accomplish. Of the other means, spraying is regarded as the most reliable, and Bordeaux mixture and lime sulfur as the most efficient applications. Experience covering 1916–17 and 1923–24 is detailed.

Black spot or bacterial crack of the peach, R. A. JEHLE (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 15 16*).—Peach black spot (variously named as attacking leaves, twigs, or fruit) is here described as occurring in practically all peach-growing regions of the eastern and the middle western United States and as particularly destructive in the humid portions of the southern States. Protective measures include the removal of diseased parts, spraying with 4–4–50 Bordeaux mixture just previous to bud opening, the use afterwards of the regular brown-rot curculio sprays (self-boiled lime sulfur and lead arsenate), and the employment of thorough cultivation of the orchard and proper fertilizers to build up disease resistance in the trees.

The defoliation of peach trees in relation to spray materials and bacterial shot-hole, J. F. ADAMS (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 17–21*).—Observations during four years in Delaware have for the most part associated peach-tree defoliation with weather conditions, spray materials, and bacterial shot hole as factors acting individually or in combination. Underfeeding is not generally considered as a predisposing factor. These factors are dealt with in some detail.

The leaf-scar lesions on peach trees, J. F. ADAMS (*Peninsula Hort. Soc. [Del.] Trans., 38 (1924), pp. 22–26*).—Correlated with peach tree premature defoliation are small necrotic lesions at points from which young leaves have fallen. The nature and function of the leaf scar is discussed. During 1923 cultures of such lesions showed the presence of an organism which, however, failed to appear in 1924. Extensive observation during three years has given evidence that the leaf-scar lesions may be produced in the sensitive tissue exposed after leaf fall by the sulfur or arsenical content of the sprays used. Elimination of the difficulty is to be found in the prevention of premature defoliation of the peach, which for the most part, under Delaware conditions, is the result of bacterial shot-hole infection.

Citrus melanose and its control, J. R. WINSTON, J. J. BOWMAN, and W. J. BACH (*U. S. Dept. Agr. Bul. 1474 (1927), pp. 63, pls. 10, figs. 17*).—This account, which gives more detail than the one previously noted (E. S. R., 48, p. 849), and which notes the recent contribution by Wolf (E. S. R., 56, p. 152), records results of citrus melanose studies, including the relative susceptibility to melanose of citrus and other rutaceous plants, the effect of temperature upon infection of potted citrus seedlings, the determination of the stage of practical immunity, and the results of experimental tests and of horticultural practices for melanose control. Chiefly, the discussions relate to orange and grapefruit.

Phomopsis citri causes a melanose on all Florida commercial citrus plants, as well as a Florida citrus stem-end rot. The fungus sporulates in nature only in dead bark of twigs and limbs, never having been observed in or cultured from melanose lesions on living parts. Spore production, germination, infection, and

incubation are markedly retarded by temperatures either above or below the supposed optimum range of 68 to 81.5° F. (20 to 27.5° C.). Infection may take place at any time of the year when rainy periods occur while growing parts are in a susceptible stage. Leaves of orange and grapefruit are susceptible from the time they emerge until they become distinctly tough, a period of two or three weeks. Fruits, at first very susceptible, acquire an increased resistance with increase of size, until practical immunity is attained at a diameter of 1.5 in. for oranges and 2.5 in. for grapefruit. Under Florida conditions, oranges and grapefruits from February or March bloom become practially immune in May, seldom being susceptible after June 10.

Pruning has not proved to be dependably protective under ordinary commercial conditions. Severe pruning or deheading, such as is practiced after damaging freezes, usually gives good control of the disease if done before May rains begin. Dusts have not as a rule given satisfactory control. Sulfur sprays and the weaker copper sprays have failed repeatedly to control melanose. One application of 3-3-50 Bordeaux mixture plus 1 per cent oil as emulsion, if properly timed, gives excellent control even under adverse conditions. Ordinarily the best time is just before the May rains, usually before May 5. Delay at this critical time weakens preventive action, though sprays applied before blossoms open may reduce melanose measurably. Applications in early April, late April, and early May give increasing protection. Spring applications of Bordeaux oil emulsion should be followed in late June or early July by oil emulsion for scale insects.

See also a further article by Wolf, previously noted (E. S. R., 57, p. 156).

A die-back of rambler roses due to Gnomonia rubi Rehm., W. J. Dowson (*Jour. Roy. Hort. Soc., 50 (1925), No. 1, pp. 55–72, pls. 4, fig. 1*).—A die-back of rambler roses is described as shown to be in causal relation with *G. rubi*, which is said to be found also on brambles. An account is given of the growth characters, asci, and ascospores developed in pure growth cultures on various media.

The Phomopsis disease of conifers (Phomopsis pseudotsugae Wilson) (*[Gt. Brit.] Forestry Comn. Leaflet 14 (1926), pp. 5, figs. 3*).—Though found on Japanese larch and on other conifers, this disease, caused by *P. pseudotsugae*, occasions the most serious damage to Douglas fir, causing shoot die-back, stem girdling, and stem canker. Trees not over 25 years of age may be attacked, but girdling is confined to trees not over 8 years old. The contrast is shown between the fungus *P. pseudotsugae* and that causing larch canker, *Dasyscypha calycina*. Caution should be exercised in planting to avoid the neighborhood of infected trees (such trees should be removed), to avoid wounding the stems in pruning and other operations, and to eradicate infected material.

A fatal disease of eucalyptus [trans. title], M. Turconi (*Atti Ist. Bot. R. Univ. Pavia, 3. ser., 1 (1924), pp. 125–135, pl. 1*).—In the Pavia Botanical Gardens, eucalyptus of 2 or 3 years, including several species named, are attacked fatally by disease. Several fungi are present, including the supposed new species *Physalospora eucalyptorum*, *Macrophoma eucalyptorum*, and *Gloeosporium eucalyptorum*. Technical descriptions are furnished.

Recent studies on oak mildew [trans. title], M. de Koning (*Tijdschr. Plantenziekten, 31 (1925), No. 1, pp. 15–17*).—A brief account is given of oak mildew studies by the author and of reports by others named.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The ecology of a sheltered clay bank; a study in insect sociology, P. Rau (*Acad. Sci. St. Louis, Trans., 25 (1926), No. 7, pp. 157–277, pls. 8*).—After a

brief introduction the author deals with the interrelations of animal life, followed by an extended account of the relation of population to environment.

Water binding capacity of colloids a definite factor in winter hardiness of insects, W. ROBINSON (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 80–88, figs. 5*).—The author finds that colloids present in insect tissues and body liquids withdraw and bind free water under a falling temperature. Some of the properties are changed when water is bound, and this protects the insect during the winter. There is a direct correlation between winter hardiness of insects and amount of water bound.

Tree injection for control of fungous diseases and insect pests, C. M. SCHERER (*Phytopathology, 17 (1927), No. 1, p. 51*).—From injections of numerous chemicals into chestnut, white and gray birch, apple, and elm for the control of the chestnut blight, bronze birch borer, and European elm scale, only negative results were obtained. The smallest amount of any injected material was 0.5 gm. of arsenic trioxide in a 1.25-in. birch, and the largest amount was 1,045 gm. of strychnine sulfate in a 23-in. birch.

The Beauveria effusa (Beauv.) Vuill. parasite of the Colorado potato beetle [trans. title], R. DIEUZEIDE (*Rev. Zool. Agr. et Appl., 25 (1926), Nos. 9, pp. 129–134; 10, pp. 145–154, pl. 1, figs. 3*).—A report of studies of this fungus, which the author finds readily attacks a number of other insects, including *Smerinthus populi*, *Pieris brassicae*, *Cnethocampa pityocampa*, *Sesamia nonagrioides*, and *Agrotis ypsilon*.

Nut insects [trans. title], J. FEYTAUD (*Rev. Zool. Agr. et Appl., 25 (1926), Nos. 7, pp. 97–102; 8, pp. 121–128, figs. 2*).—A brief summary of information.

[Economic insects] (*Peninsula Hort. Soc.* [*Del.*] *Trans., 40 (1926), pp. 12–28*).—Papers are presented on Source of Codling Moth Infection, by H. L. Dozier (pp. 12–14), based on investigations previously noted (E. S. R., 56, p. 356); Insects of the Year, by E. N. Cory (pp. 14, 15); An Operation in Practical Control of Codling Moth in a Heavily Infested District, by T. J. Headlee (pp. 16–25), based upon investigations noted on page 454; and successful Codling Moth Control, by B. W. Douglass (pp. 25–28).

[Report of work in entomology at the Missouri Station, 1925–26], L. HASEMAN and K. C. SULLIVAN (*Missouri Sta. Bul. 244 (1926), p. 36*).—In experiments with calcium cyanide for greenhouse fumigation it was found that most plants can stand a dose of 0.02243 gm. per cubic foot. White flies and greenhouse plant lice can be killed with a dosage of 0.00945 gm. for each cubic foot. Greenhouse scale require 0.01475 gm., thrips 0.02835 gm., and red spiders 0.08505 gm. for each cubic foot.

Three dust formulas were used in the orchard dusting experiments for codling moth, as follows: (1) Sulfur 90 lbs. and arsenate of lead 10 lbs., (2) sulfur 85 lbs. and arsenate of lead 15 lbs., and (3) hydrated lime 80 lbs., powdered copper 12 lbs., and calcium arsenate 8 lbs. The sulfur and arsenate of lead proved most effective. Sodium fluosilicate showed promise as being valuable for the control of the more resistant chewing insects, such as the striped cucumber beetle.

A brief reference is made to a study of the life cycle of the codling moth and its control by insecticides. The effect of different nozzles and different pressures used in sprays for this pest is reported upon in tabular form.

Insect pests newly established in New York State, E. P. FELT (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 63–67*).—It is pointed out that three beetles native to Japan have recently appeared in New York State, namely, the Japanese beetle, the Asiatic beetle (*Anomala orientalis* Waterh.), and the Japanese Serica (*Aserica castanea* Arr.), the grubs of all three being serious pests to

sod. Record is made of 13 insects which have appeared in the State during the past 25 years, with data on their economic status.

Further experiments with poisoned baits for grasshoppers, M. H. SWENK (*Nebraska Sta. Research Bul. 41 (1927), pp. 44*).—This is a report of investigations of poisoned baits conducted with the two-striped grasshopper in 1922 and 1923, in which the author was assisted by E. E. Wehr and L. G. Worley. A report on the early work, which appeared in Bulletin 183, has been noted (*E. S. R., 48, p. 551*).

The results obtained in the 1923 experiments confirmed those of the preceding year, indicating that molasses not only does not increase but actually reduces the attractiveness of baits poisoned with white arsenic, since such baits were 22 per cent more attractive without molasses than with it. On the other hand, the experiments indicated that molasses increased the attractiveness of baits poisoned with sodium arsenite solution by 32 per cent. This has led to the recommendation that molasses be omitted in baits poisoned with white arsenic or other dry poisons, but that it be included at the rate of 2 qt. to 25 lbs. of bran in baits poisoned with sodium arsenite solution. The addition of 1 lb. of calcium chloride to 25 lbs. of bran would be advantageous in helping to keep the bait in a moister and more attractive condition in hot, dry weather, were it not that its high cost makes its use impracticable. Baits recently prepared were distinctly (21 per cent) more attractive to grasshoppers than baits of the same composition that had been allowed to become stale and fermented.

Cotton-jassid in South Africa, J. L. MOERDYK (*Trop. Agr. [Trinidad], 4 (1927), Nos. 3, pp. 46, 47; 4, p. 73*).—Brief notes relating to a pest which seriously affects the cotton crop in South Africa, especially in the lower parts of the country.

The artificial culture and dissemination of *Entomophthora sphaerosperma* Fres., a fungous parasite for the control of the European apple sucker (*Psyllia mali* Schmidb.), A. G. DUSTAN (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 68–75, pl. 1*).—A brief account of fungus control work with the European apple sucker (*P. mali*), a pest introduced into Nova Scotia prior to 1919. An earlier account by the author has been noted (*E. S. R., 53, p. 756*). The work of rearing and spreading this fungus is said to have met with unexpected success, it having been found an easy matter in years of average rainfall to grow the disease in cages and start epidemics in the field from such source.

Observations on the biology of a new geranium aphid (*Macrosiphum cornelli* Patch), G. H. GRISWOLD (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 91–94*).—The author here discusses the host plants of *M. cornelli* Patch, the number of instars, the length of the reproductive period, and the number of young produced. Notes are given on 4 hymenopterous parasites reared from the aphid, including a braconid, *Praon simulans*, and 3 chalcids *Aphelinus jucundus*, *A. semiflavus*, and *Aphidencyrtus inquisitor*. Control measures are suggested.

Metamorphosis and reproduction in apterous forms of *Myzus persicae* Sulzer as influenced by temperature and humidity, A. WEED (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 150, 157, figs. 2*).—The author reports studies which have been conducted in control chambers in which the temperature and humidity have been constant. The retardant influence of low temperature and humidity on the rate of development and reproduction of the species, together with the corresponding acceleration which increases in these factors of the environment bring forth, are indicated in tabular and graphic form.

The peach cottony scale, P. J. Parrott and S. W. Harman (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 146–150*).—The data here presented have been noted from another source (E. S. R., 56, p. 257).

Notes on silkworm nutrition, F. L. Campbell (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 88–90*).—Since nutritive liquids such as cow's milk can be fed to certain insects such as the silkworm and utilized for maintenance, it is pointed out that it should be possible to determine the essential food components of insect diet and their relative proportions.

Flacherie of the silkworm and its causes [trans. title], A. Paillot (*Compt. Rend. Acad. Sci. [Paris], 183 (1926), No. 6, pp. 402–404*).—The author points out that under the name flacherie are grouped a number of diseases of the intestinal tract which have some symptoms in common and that are differentiated better by the cause than by the lesions produced. In the present contribution he reports upon observations of two of these affections in the Department of Ardèche, one of the most important sericultural regions of France. See also a previous note (E. S. R., 57, p. 281.)

On flacherie of the silkworm [trans. title], A. Paillot (*Compt. Rend. Soc. Biol. [Paris], 95 (1926), No. 35, pp. 1370–1372*).—Supplementing his account of two forms of noninfectious flacherie of the silkworm, above noted, the author here describes a third form.

Flacherie or "wilt disease" of silkworms, C. S. Gibbs and C. Ken (*China Jour. Sci. and Arts, 5 (1926), No. 2, pp. 83–87, pls. 2; also Univ. Nanking, Col. Agr. and Forestry Bul. 14 (1926), pp. 83–87, pls. 2*).—This is an account of studies of *Micrococcus bombycis* n. sp. isolated from flacherie silkworms, which, when inoculated into healthy silkworms, produced typical symptoms of the disease. This organism was not pathogenic to the larvae of moths found in China other than silkworms. It is stated that during the course of five years' investigations of silkworm diseases in China 500 flacherie silkworms from sericulture plants in Shantung, Chekiang, and the Yangtze Valley have been cultured and *M. bombycis* isolated in pure culture from all of them.

Stomach poisons for control of the squash vine borer (Melittia satyriniformis Hbn.), C. R. Cleveland (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 135–143*).—This is a contribution from the Indiana Experiment Station.

Experiments conducted over a period of 3 years indicate that under certain conditions of exact timing and direction of applications certain stomach poison insecticides give satisfactory and practical control at low cost. Bordeaux 4–4–50 and arsenate of lead spray gave an 88 per cent control, the best of any tested.

The pine tipmoth in the Nebraska National Forest, M. H. Swenk (*Nebraska Sta. Research Bul. 40 (1927), pp. 50, figs. 9*).—This is an account of a native species of Rhyacionia, *R. frustrana* Comst., commonly known as the pine tip moth, it being probably the most important of the eight indigenous species of the genus and closely related to the European pine shoot moth. This tip moth first attracted attention in 1876 when it was observed attacking young pines on Nantucket Island, Mass., but not until 1909 was it observed in the Nebraska National Forest, where it had been introduced some time during the preceding seven years. In its attack upon the pine it is a principal source of injury to young and rapidly growing trees. The newly hatched larvae first attack the bases of the needles or needle clusters, then later move to the tip of the growing shoot and start a burrow there, usually in or near the terminal bud. When this portion of the shoot is consumed, the larvae burrow downward within it, usually killing it down as far back from the tip as the burrow extends. When this attack is repeated during successive seasons, the tree is

forced to make an unsymmetrical, bushy type of growth that largely destroys its value and beauty.

There are two complete but overlapping generations annually in the Nebraska National Forest. The winter is passed in silken cocoons spun during the latter part of August and early September by the second brood of larvae. The moths of the first brood fly about among the trees on warm, still days during May and deposit their tiny, rounded, flat, yellowish eggs singly or in very small groups on the outside of the leaf bud scales. Oviposition takes place at night. In 6 days or more these eggs hatch into larvae 1 mm. or slightly over in length, and pale yellowish with a black head in color. These first attack the needles, then the terminal buds, and finally the interior of the growing shoots, varying their movements somewhat according to the species of pine upon which they are working. The period of larval development of this brood extends from late May to late July, there having been a seasonal variation of fully 3 weeks between the early season of 1911 and the late season of 1909. Pupation by the first brood takes place invariably in the larval burrow in the pine shoots. The total season during which first brood pupae may be found extends from early June to late July, though the individual pupal period is only about 9 to 13 days. The adults of the second brood appear in flight from the latter part of June to the latter part of July, and deposit their eggs chiefly on the contiguous surfaces of two pine needles, but also elsewhere on the needles and their sheaths. The eggs hatch in 6 to 9 days and larval development begins in early July.

Removal of infested tips as a control measure led to the conclusion that though the first brood of larvae may be limited in this way an influx of moths of the second generation from infested trees elsewhere will replenish the infestation by the second brood of larvae to the normal number. This tip moth is known to be parasitized by 2 ichneumons, 1 braconid, 4 chalcids, and 1 tachinid parasite, and the eggs of the moth by a minute chalcid parasite.

The account includes a list of 25 references to literature.

An operation in practical control of codling moth in a heavily infested district, T. J. Headlee (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 158–167*).—This contribution from the New Jersey Experiment Stations records the results of a year's effort against the codling moth carried out by a group of 11 growers associated for the purpose and cooperating with the station entomologist.

The conclusions are that (1) under the local conditions of heavy infestation of codling moth, this insect can be suppressed by intensive work against it; (2) the most intensive part of the effort is the cover spray program against the entering larvae of the first brood; (3) where the insect has been suppressed, a very high percentage of the picked fruit can be brought through absolutely free from codling moth injury by intensive work against the first brood only.

Results of different insecticide treatments on the control of codling moth in the Pacific Northwest, W. S. Regan (*Watsonville, Calif.: Calif. Spray Chem. Co., 1927, pp. 20; abs. in Jour. Econ. Ent., 20 (1927), No. 2, p. 249*).—This is a paper presented by the author at the annual meeting of the American Association of Entomologists at Philadelphia in December, 1926.

In the work conducted, 2 lbs. of arsenate of lead to 100 gal. of water was found insufficient to give effective control of the codling moth, with 5 thorough applications, under conditions of moderately severe infestation in the Yakima Valley of Washington. There was little difference in the results between the 3-lb. and the 4-lb. dosage. The use of a calcium caseinate spreader increased the effectiveness of the arsenate of lead, but there was no definite evidence

that an amount larger than 0.5 lb. of spreader in 100 gal. gave better results than the smaller amount. A combination of arsenate of lead with summer oil gave by far the best results in the control of codling moth, and the use of summer oil alone gave results that compared favorably with some of the tests with arsenate of lead. There appears to be little evidence of distinct "peaks" or "broods" in the activities of the codling moth in heavily infested districts of the Northwest from a control standpoint. A calyx spray seems unnecessary in these districts, where frequent and thorough applications are made and begun before earliest hatching takes place.

Effective control of San Jose scale in midsummer was found to be possible by the use of summer oil.

The results of the work conducted in attempting to remove spray residue by wiping with a commercial machine indicate that blotched arsenate of lead, i. e., lead without spreader, offers considerable difficulty in the removal of spray residue from the fruit. Oil spray over blotched arsenate of lead also seems to interfere with best results in cleaning the fruit. Oil spray over lead and spreader (Hercules) offers no difficulty. The reference to "oil spray" is to strictly "summer oil" of the highly refined type. The combination spray of arsenate of lead with the oils tested and spreader gave excellent results, comparatively speaking, in the removal of spray residue by wiping, whereas this combination without spreader interfered with wiping. Certain brands of arsenate of lead wipe with much greater difficulty than others. It is pointed out that different kinds of spreader undoubtedly influence the ease of wiping.

Further studies of baits for oriental fruit moth control, S. W. FROST (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 167–174, pl. 1, fig. 1*).—In reporting upon investigations conducted at the Pennsylvania Experiment Station, it is pointed out that while fermenting baits give, on the whole, larger catches, the nonfermenting baits have a longer period of activity and may prove more practical for control purposes. The results clearly indicate that a more attractive bait must be had before adequate control can be expected. Orchard tests where the infestation is not high show a reduction of nearly 30 per cent of wormy fruit.

Some baits more attractive to the oriental peach moth than black-strap molasses, A. PETERSON (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 174–185*).—The author reports that of some 250 aromatic chemicals tested terpineol and several essential oils (fennel, bergamot, star anise, anise seed, and *Pinus sylvestris*) were somewhat attractive to moths. Fermenting fruits, particularly prunes, pears, and apricots, were found to attract a goodly number of moths. Baits made of cheap blackstrap molasses (5 to 20 per cent dilutions) were found to be fairly attractive, but they usually produce considerable scum and their period of attractiveness is not very long. Honey, corn sirups, refiner's sirups, and brown sugar (5 or 10 per cent solutions) were much more attractive than blackstrap molasses.

The hibernation quarters of Laspeyresia molesta Busck, L. A. STEARNS (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 185–189, pls. 2*).—This is a contribution from the New Jersey Experiment Stations. The studies reported, covering the years 1924, 1925, and 1926, although disclosing the fact that cultivation and the paradichlorobenzene treatment should destroy a high percentage (86 per cent) of the hibernating peach moth, indicate an overwintering population in the upper portions of the tree sufficiently large to constitute a continuance of infestation from year to year in spite of the thorough application of these measures.

Laspeyresia molesta as an apple pest, E. N. CORY and H. S. MCCONNELL (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 190–[illegible]*).—The author reports that a

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high percentage of cull apples in Maryland in 1926 was infested by the oriental fruit moth (*L. molesta*).

Clothes-moths and carpet-beetles, E. McDaniel (*Michigan Sta. Circ. 104* (*1927*), *pp. 20, fig. 1*).—This is a practical digest of information on these pests.

Flies, particularly their rôle in the cause and in the transmission of disease and their control [trans. title], W. von Schuckmann (*Centbl. Bakt.* [*etc.*], *1. Abt., Ref., 81* (*1926*), *Nos. 21-22, pp. 481-505; 23-24, pp. 529-568*).—This is a summary of information on the relation of flies to disease. A bibliography of 13 pages is included.

The apple maggot in Michigan, D. T. Ries (*Jour. Econ. Ent., 20* (*1927*), *No. 1, pp. 144-146*).—It is pointed out that the apple maggot has once more caused severe losses in Michigan after a dormacy of about a quarter of a century.

The cabbage maggot and its control, H. L. Gui (*Ohio Sta. Bimo. Bul., 12* (*1927*), *No. 3, pp. 92-99, figs. 3*).—This is a brief summary of information on the cabbage maggot and means for its control.

Further observations on the life history, habits, and control of the narcissus bulb fly, Merodon equestris, with data on the effects of carbon disulphide fumigation on three bulb pests, B. M. Broadbent (*Jour. Econ. Ent., 20* (*1927*), *No. 1, pp. 94-113*).—Data on the narcissus bulb fly which supplement the account by Weigel previously noted (E. S. R., 55, p. 558) are presented, in large part in tabular form.

Hot-water bulb sterilizers, C. A. Weigel (*Jour. Econ. Ent., 20* (*1927*), *No. 1, pp. 113-126*).—This is a discussion of the various types of sterilizers used to disinfect narcissus bulbs imported under special permit and in accordance with the requirements of the Federal Horticultural Board.

A means of control of the European hen flea (Ceratophyllus gallinae Schrank), M. A. Stewart (*Jour. Econ. Ent., 20* (*1927*), *No. 1, pp. 132-134*).—Spraying buildings with Phinotas disinfectant and dipping the birds in the same material has been found to be a satisfactory means of control.

A life history study of important lady-beetle predators of the citrus aphid, W. L. Thompson (*Fla. Ent., 10* (*1926*), *Nos. 3, pp. 40-46, fig. 1; 4, pp. 57-59, fig. 1*).—The life history of the Chinese lady beetle (*Leis* sp.), introduced into Florida from California in May, 1925, is dealt with, including its feeding habits, hibernation, oviposition, etc.

Notes on the occurrence of Luperodes thoracicus as an insect pest of fruit trees, T. L. Guyton (*Jour. Econ. Ent., 20* (*1927*), *No. 1, pp. 193, 194*).—This small dark beetle, not previously known to occur in numbers sufficient to cause any economic concern, was found in an orchard in the central part of Pennsylvania doing damage to the foliage of peach, apple, and plum, and slightly damaging the fruit of apple.

Preliminary studies on the relation of fire injury to bark-beetle attack in western yellow pine, J. M. Miller and J. E. Patterson (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 7, pp. 597-613, figs. 7*).—Studies on the effect of fire in pine forests of the Pacific slope region show that fires can be of little benefit in reducing beetle losses through killing the beetles unless the fires are severe enough to kill the trees; neither do fires have any permanent effect in increasing beetle losses in surrounding timber. The principal rôle of bark beetles in connection with forest fires is in the added destruction by the insects of moderately fire-injured trees, which otherwise would have survived.

The black vine weevil (Brachyrhinus sulcatus Fabr.) as a pest in greenhouses and nurseries, F. F. Smith (*Jour. Econ. Ent., 20* (*1927*), *No. 1, pp. 127-131*).—This is a progress report on studies of *B. sulcatus* Fab. in nurseries and greenhouses in Pennsylvania. Its distribution in Pennsylvania, the possi-

bility of its being distributed by means of Taxus as balled nursery stock, and the relationship between greenhouse infestations and Taxus are discussed. Life history studies indicate that greenhouse plants are infested by adults developing out of doors and that the species is capable of parthenogenetic reproduction. Dry lead arsenate mixed with the potting soil is said to give promise as a control measure.

The infectious diseases of the honey bee, A. BORCHERT (*Die Seuchenhaften Krankheiten der Honigbiene. Berlin: Richard Schoetz, 1926, 2. ed., rev., pp. [5]+98, figs. 45*).—This is a second, revised edition of a work previously noted (E. S. R., 54, p. 159).

Go to the ant, E. STEP (*London: Hutchinson & Co., 1924, pp. XII+276, pls. 32*).—This is a popular account of the natural history of ants in all countries.

The parasites of the pine tip moth, Rhyacionia frustrana (Comstock), R. A. CUSHMAN (*Jour. Agr. Research [U. S.], 34 (1927), No. 7, pp. 615–622, fig. 1*).—This is an annotated list of 21 species of parasitic Hymenoptera and 2 species of parasitic flies that attack *R. frustrana bushnelli* Busck, an account of which tip moth by Swenk is noted above. A key for the identification of these parasites is included.

A study in hyperparasitism, with particular reference to the parasites of Apanteles melanoscelus (Ratzeburg), C. F. W. MUESEBECK and S. M. DOHANIAN (*U. S. Dept. Agr. Bul. 1487 (1927), pp. 36, figs. 10*).—This bulletin is an attempt to review briefly the more general features of hyperparasitism, and to present certain data upon the habits, biology, and interrelationships of the hyperparasites affecting *A. melanoscelus* (Ratz.), a valuable primary parasite of the gypsy moth. In the course of the studies some 35 species of hyperparasites have been reared from cocoons of *A. melanoscelus*, of which 14 are responsible for more than 90 per cent of the total parasitism. Of these, 4 species, *Eurytoma appendigaster* (Swed.), *Dibrachys boucheanus* (Ratz.), *Hemiteles tenellus* (Say) and *Dimmockia incongruus* (Ashm.), destroy many more Apanteles than all the other species combined. A list is given of 38 references to the literature cited.

Observations of the parasites and hyperparasites of Hyponomeuta malinellus Zell [trans. title], P. VOUKASSOVITCH (*Compt. Rend. Soc. Biol. [Paris], 96 (1927), No. 3, pp. 170–172*).—A brief summarized account of observations of parasites of this fruit tree pest.

ANIMAL PRODUCTION

[Nutrition studies at the Missouri Station] (*Missouri Sta. Bul. 244 (1926), pp. 19, 29*).—Results of two experiments are noted.

Nutritional requirements of poultry, A. G. Hogan and C. L. Shrewsbury.—A study of synthetic diets has been continued (E. S. R., 54, p. 270), adding 10 per cent of either dried egg yolk or wheat germ, and such diets have supported normal growth. Extracting dry egg yolk and wheat germ with ether and following by alcoholic extraction and adding this latter extract to synthetic diets has given quite satisfactory results. Dry yeast used as a source of vitamin B and supplied at the rate of 9 per cent was not satisfactory, and only when fed at a higher level, 15 per cent, were encouraging results obtained. Commercial vitamin B concentrate was active enough to make its use encouraging.

The relation of diet to bodily activity and to capacity to withstand unfavorable circumstances, A. G. Hogan and H. M. Harshaw.—In continuing this work (E. S. R., 53, p. 464), it was found that 36 female rats on a ration free of vitamin B produced only 28 litters, had 59 resorptions, gave birth to 187 young, retained 134, and reared 11 young. Contrasted with this, 13 females receiving

vitamin E had 36 litters, resorbed 2, gave birth to 223 young, retained 190, and reared 107 young. It has been suggested that this vitamin was identical with the pyrrole nucleus of hemoglobin and was necessary for the formation of red blood cells. Blood counts did not show that failure to reproduce was due to anemia.

Calcification studies with rats fed menhaden oil and various menhaden fish meals, R. C. Miller and L. A. Maynard (*Amer. Jour. Physiol., 79 (1927), No. 3, pp. 626–632, figs. 2*).—In experiments at the New York Cornell Experiment Station, rats were fed rations containing 15 per cent of four different brands of menhaden fish meal in comparison with a ricket-producing ration and another ration in which the calcium and phosphorus content was so modified as to permit the substitution of fish meal without changing the mineral proportions.

The protein content of the various rations remained unchanged. Calcification was measured by the ash content of the femur and tibia. A check group of rats was killed at the beginning of the experiment to determine the ash content of the bones when animals were placed on these rations. Since menhaden fish meal contained from 4 to 8 per cent of oil, further tests were undertaken to find out if menhaden oil contains the factor assisting in calcification. A lot of rats was fed the basal ration plus an alcoholic extract of menhaden fish meal approximately equal to 10 mg. of oil, and another lot 10 mg. of oil.

Rats receiving fish meal grew more rapidly than those receiving the basal rations, and the ash content of the bones was approximately 15 per cent higher than in the case of the rats on a rachitic ration. The rats fed the alcoholic extract of fish meal did not grow as rapidly during the early part of the experiment as the other groups. This probably was due to the low food intake, the author believing the ration to be unpalatable. Both this group and the group fed oil showed approximately 10 per cent more ash in the bone than the basal groups. These data show that both menhaden fish meal and menhaden oil contain the specific factor that aids in calcification.

Inspection of feeds, J. B. Smith and R. A. Greene (*Rhode Island Sta. Ann. Feed Insp. Circ., 1927, pp. 8*).—Guaranties and analyses for protein and fat are presented for 113 samples of feeding stuffs analyzed during the season of 1926–27 (E. S. R., 56, p. 69).

Beef cattle investigations, 1926–27 (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1927, pp. [8]*).—Six lots of yearlings and 6 lots of calves, of 10 animals each, were fed so that one group of each duplicated the other. Lot 1 of each class of stock received shocked kafir, lot 2 kafir silage, and both lots received 4 lbs. of alfalfa hay as supplement. Lots 3 and 4 were fed as above except that 1 lb. of cottonseed cake replaced the alfalfa hay. Lot 5 was fed cottonseed hulls and lot 6 wheat straw, and both lots received 2 lbs. of cottonseed cake in addition. The kafir stover was of poor quality, the grain amounting to but 102 lbs. per acre.

On a ton basis, shocked kafir fed to yearlings produced 47.7 per cent more gain than kafir silage when both were supplemented with alfalfa hay, and 106.4 per cent more gain when supplemented with cottonseed cake. On an acre basis, kafir silage produced 71.4 per cent more gain than shocked kafir when each was supplemented with alfalfa, and 22.5 per cent more gain when each was supplemented with cottonseed cake. Cottonseed hulls and wheat straw supplemented with 2 lbs. of cake was not as good a winter ration as either shocked kafir or kafir silage supplemented with 1 lb. of cake. Cottonseed hulls proved to be a little more satisfactory than wheat straw. One lb. of 43 per cent protein cottonseed cake was slightly superior to 4 lbs. of alfalfa hay as

a protein supplement to shocked kafir, but not quite so efficient when fed with kafir silage. The results obtained with calves were practically identical with those obtained with yearlings.

A test conducted with a salt mixture, claimed to be a fly repellent, with yearling cattle on pasture showed no beneficial effects for the "fly" salt.

Tables giving the detailed results of the experiments are included in the publication.

A technical study of the digestibility of corn stover silage for beef cows, T. S. Hamilton and H. P. Rusk (*Illinois Sta. Bul. 291 (1927), pp. 465–484*).—This is a more detailed account of work previously noted (E. S. R., 54, p. 357).

Type in two-year-old beef steers, F. S. Hultz and S. S. Wheeler (*Wyoming Sta. Bul. 155 (1927), pp. 125–148, figs. 8*).—Studies on type have been continued (E. S. R., 57, p. 267) with 2-year-old steers. The cattle were divided into three groups, low-set, intermediate, and rangy, according to visual observation and body measurements, as previously explained.

The low-set steers made more rapid and slightly more economical gains than the intermediate steers, and the latter excelled the rangy steers in these respects. The steers did not change their visual type in a 156-day feeding period. The body measurements of the different types more nearly resembled each other at the end of the experiment than they did at the beginning. Under the conditions of this experiment all lots returned a profit.

How much does a calf cost? W. H. Black (*Cattleman, 13 (1927), No. 12, pp. 15, 16, figs. 2*).—The U. S. Department of Agriculture and the Texas Experiment Station have completed a four-year study of the cost of producing calves on 40 ranches in north-central Texas. With a 65 per cent calf crop the cost of producing calves averaged $29 per head from birth to weaning time. The cost of producing beef cattle is divided as follows: Depreciation of breeding herd 24 per cent, interest 17, hired labor 10, winter feed 10.5, taxes 9, death loss 6, and miscellaneous small items 23 per cent.

The condition of the range is deemed probably the biggest factor affecting the calf crop. Over this the ranchman has no control except in the matter of overstocking. Cows that are in poor condition due to lack of feed do not breed regularly, and consequently lessen the calf crop. The number of bulls used was not an important item in the production of calves. The data are based on the records of 27,776 cows, 18,150 calves, and 1,058 bulls.

Factors which influence the quality and palatability of meat, E. A. Trowbridge, A. G. Hogan, et al. (*Missouri Sta. Bul. 244 (1926), pp. 25–27*).—Steer calves on a ration of shelled corn, linseed oil meal, alfalfa hay, and corn silage made somewhat greater and more economical gains than heifer calves on a similar ration. Heifers reached a fat market condition in 80 days less time than the steers and returned a greater margin over feed cost.

Steers full fed grain for 140 days made an average daily gain of 2.25 lbs., while a lot receiving a half grain ration and all the silage and alfalfa hay they would eat gained at the rate of 1.73 lbs. daily. Another lot wintered on silage and hay gained 1.06 lbs. daily. Heifers full fed and those half fed made average daily gains of 2.01 and 1.67 lbs., respectively. The more grain the calves consumed the less roughage was eaten.

The work at the Sni-a-Bar Farm consisted of 4 lots of steer calves. One lot ran with their dams and received no grain during the pasture season. Another lot ran with their dams but had access to grain mixtures in a self-feeder. A third lot grazed separately from their dams was allowed access to grain and was also allowed to nurse twice daily. The fourth lot consisted of calves separated from lot 1 a month before weaning and fed a grain mixture. The

calves running with their dams and sold at weaning time returned more profit than those that were creep fed. This latter method was more satisfactory than separating the calves from their mothers. Calves fed grain for a month before weaning weighed 50 lbs. more and sold for 50 cts. per 100 lbs. more than those that had had no grain. Calves fed grain before weaning made as rapid but less economical gains after weaning as those fed no grain and reached a desirable market condition in less time.

The physiology of reproduction in the cow, J. HAMMOND (*Cambridge, Eng.: Univ. Press, 1927, pp. XVI+226, pls. 33, figs. 4*).—The data presented in this treatise were collected from 2- to 3-year-old crossbred Shorthorn heifers and from organs collected from slaughterhouses. In addition much information was obtained from experienced stockmen. The main topics covered are the breeding season, the oestrous cycle, pregnancy, and sterility. Appendixes contain replies of herdsmen to questions and extracts from observations on an experimental heifer.

[Feeding experiments with sheep at the Missouri Station], M. T. FOSTER (*Missouri Sta. Bul. 244 (1926), pp. 28, 29*).—Results of two experiments are briefly noted.

Methods of wintering pregnant ewes and fattening their lambs for early market.—Lambs averaging 35 days of age were started on creep feeding March 9 on a ration composed of corn, oats, bran, and linseed oil meal 3:3:1:0.5. On April 30 the ration was changed to oats, bran, and linseed oil meal 6:2:1. After April 14 the lambs had access to rye and bluegrass pasture for a few hours daily. The average daily gain under this system of management was 0.373 lb., and the lambs required 1.64 lbs. of feed for 1 lb. of gain (E. S. R., 54, p. 759).

Fattening lambs in the corn field.—Three 1-acre plats were planted in corn. Plat 1 was also seeded with cowpeas and plat 3 with soy beans. The corn yield was estimated to be from 25 to 30 bu. per acre. Lambs averaging 56 lbs. were turned into the plats on September 30. At first they ate only the grass and weeds. Lots 1 and 3 started eating cowpeas and soy beans the second week and during the third week the lower blades of corn. By the end of the fourth week the forage in all lots had been cleaned up and the lambs had started to eat corn. From October 27 to November 10 the lambs were fed 6 lbs. of mixed hay each evening. The lambs in lot 1 gained 24.75 lbs., in lot 3 23.5, and those in lot 2 lost 0.25 lb. while in the corn field. All lambs were finished in dry lot.

Fertility and sex-ratio in Welsh Mountain sheep with special reference to the effects of environment, R. G. WHITE and J. A. F. ROBERTS (*Welsh Jour. Agr., 3 (1927), pp. 70–79*).—The data given in this report were obtained by means of questionnaires sent out during the seasons 1922–23 and 1923–24, and refer solely to Welsh Mountain sheep. The flocks were divided into classes according to the nature and altitude of their ranges, as mountain, intermediate, and lowland. In the study of fertility, five factors were considered: (*a*) The number of lambs born per 100 ewes, (*b*) the percentage of barren ewes, (*c*) the percentage of ewes producing twins, (*d*) the number of lambs which are stillborn, and (*e*) the number of lambs per 100 ewes at castrating time.

The mountain flocks showed the lowest percentage in factors *a*, *c*, and *e*, and were high in factors *b* and *d*. The opposite was true in the case of the lowland sheep. The low fertility of the mountain ewes was probably due almost entirely to their poor condition, whereby usually a single ovum was released at oestrum, and hence twinning was reduced. Barrenness was also undoubtedly due to this same condition.

The sex ratio, or number of males per 100 females, for the two years averaged 90.2, 89.1, and 94.2 in the respective classes. The average for all flocks was lower than the accepted figures, but the numbers used were too low to draw any definite conclusions. There was no tendency for the sex ratio in the flocks of 1923–24 to follow that of 1922–23.

[**Experiments with hogs at the Missouri Station**] (*Missouri Sta. Bul. 244 (1926), pp. 24, 25, 27, fig. 1*).—Results of several experiments are reported in continuation of those previously noted (E. S. R., 53, p. 70; 54, p. 760).

Fecundity of swine: The normal sexual cycle and the cycle as influenced by age and by unfavorable dietary conditions, A. G. Hogan and F. F. McKenzie.—A progress report of this experiment states that a ration containing 1.0002 per cent elemental calcium gave fairly satisfactory results in the number of pigs farrowed, the number weaned, and in birth and weaning weights. Rations containing 0.5057 and 0.1865 per cent elemental calcium produced pigs that were not strong enough to live more than one day and their birth weights were low.

Forage crops for swine, L. A. Weaver.—In continuing this work 8 lots of swine were fed corn on alfalfa pasture with tankage, linseed oil meal, whole soy beans, soy bean oil meal, and combinations of these feeds. All lots made satisfactory gains both in rate and economy. There was apparently no benefit from combining the protein feeds, and in this experiment the pigs fed corn alone on alfalfa pasture made as good gains as those fed protein supplements.

Hogging down corn and soy beans, L. A. Weaver.—This study has been continued, using 6 1-acre plats. Three plats were planted to corn alone and 3 to corn and soy beans. Ten shoats were turned in each plat, those on corn receiving tankage in addition and those on corn and soy beans a mineral mixture of ground limestone, acid phosphate, and salt. The hogs receiving corn and tankage made faster gains and produced more pork per acre than those on corn, soy beans, and minerals.

Calcification studies with pigs fed different protein supplements, L. A. Maynard and R. C. Miller (*Amer. Jour. Physiol., 79 (1927), No. 3, pp. 615–625, fig. 1*).—The results of an experiment relating to the development of bone in swine is reported from the New York Cornell Experiment Station. The first two rations used in this test were similar to those previously noted (E. S. R., 55, p. 864), except that yellow hominy feed was used in place of yellow corn meal, and linseed oil meal was replaced by fish meal in the first ration. A third ration was low in minerals, and the protein supplement consisted of blood flour and casein. The fourth ration used was the same as above except that minerals were added to it. The calcium and phosphorus were balanced in rations 1 and 2 to supply them in adequate amounts and in a ratio of approximately 1:1.

Twenty pigs were divided into four lots and fed these various rations. They were so housed that they were never exposed to direct sunlight. All animals were fed for 100 days. At this date one animal from each lot was killed, subjected to post-mortem examination, and the femurs saved for analysis. Each succeeding week another animal was slaughtered and examined in the same manner.

The growth curves show that animals on rations 1 and 4 excelled somewhat in rate and regularity of gains. The animals on ration 1 showed the best physical development and condition of all groups, followed in this respect by ration 4. Ration 2, containing vegetable proteins, failed to make as good growth as the other lots. These pigs had rough coats and did not show the same body development when compared with those on rations 1 and 4. The lack of minerals in ration 3 did not affect the rate of growth in these pigs, but the general condition, body development, and growth of bone was poor. After 90 days' feeding characteristic stiffness appeared in three of these animals.

The ash-content analysis showed that rations containing fish meal and blood meal and casein caused better calcification than when linseed oil meal was used as a protein supplement. When the ration was low in calcium content, as in ration 3, the femurs showed approximately 35 per cent less ash than in the case of ration 1.

Minerals and vitamins in rations of pigs, G. Bohstedt, R. M. Bethke, B. H. Edgington, and W. L. Robison (*Ohio Sta. Bimo. Bul., 12 (1927), No. 3, pp. 67–80, figs. 9*).—This is a summary of work previously noted (E. S. R., 55, p. 666).

Care and feeding of swine, E. F. Ferrin (*Minn. Univ. Agr. Ext. Spec. Bul. 74, rev. (1925), pp. 16, figs. 4*).—This is a popular bulletin discussing the care and feeding of swine, especially in relation to the selection, feeding, and management of the sow and her litter. The value of various feeds and pastures is also discussed.

Swine production in Mississippi, P. F. Newell (*Miss. Agr. Col. Ext. Bul. 38 (1926), pp. 45, figs. 15*).—A popular bulletin, divided into two sections. The first section, by the author (pp. 5–32), deals with the practical aspects of swine production, such as breeding, feeding, management, housing, marketing, and killing and curing the pork. The second section, by C. B. Cain (pp. 32–45), discusses the principles of sanitation and the nature, cause, and treatment of the more common hog diseases.

Soybean hay and sweet-clover pasture for growing purebred draft fillies, J. L. Edmonds and C. W. Crawford (*Illinois Sta. Bul. 292 (1927), pp. 485–500, figs. 10*).—This is a more detailed account of the work previously noted (E. S. R., 56, p. 371).

Growing draft colts, D. W. Chittenden (*Missouri Sta. Bul. 244 (1926), pp. 27, 28*).—In continuing this study (E. S. R., 54, p. 762), the two-year-old colts full fed during pasture season made an average daily gain of 0.66 lb. as compared to 1.01 lbs. for those on a limited grain ration. During the winter period the colts full fed grain gained 0.85 lb. daily, while those half fed lost 0.18 lb. daily. Measurements on February 7, 1926, were slightly in favor of the full fed lot.

Stallion enrollment.—XV, Report of stallion enrollment work for the year 1926 with lists of stallions and jacks enrolled (*Indiana Sta. Circ. 137 (1926), pp. 48, fig. 1*).—This is the usual annual report (E. S. R., 54, p. 863).

[Poultry experiments at the Missouri Station] (*Missouri Sta. Bul. 244 (1926), pp. 47–49*).—Results of three experiments, together with several previously reported, are noted.

Relation of time laying starts to future production, H. L. Kempster.—Continuation of this experiment (E. S. R., 54, p. 762) showed little correlation between the date of maturity and speed of production as measured by the best month's performance.

The value of sour skim milk and beef scrap in rations for growing chicks, and the cost of growing chicks, H. L. Kempster and E. W. Henderson.—Yellow corn and white corn, with and without eggs as a supplement, were compared. Yellow corn was superior to white corn when fed without supplement, but the egg yolks corrected deficiencies of the white corn. The mortality in the lot receiving white corn alone was very high. Egg yolk gave the chicks a more thrifty appearance than those not receiving it.

Nutritional requirements of poultry, H. L. Kempster.—A ration containing 56 per cent of yellow corn was superior to a similar ration containing white corn. The birds fed white corn developed nutritional roup after 2 months on the ration and stopped laying. Changing to yellow corn checked the trouble. Adding 4 per cent of bone meal and 1 per cent of salt to the mash failed to show

any beneficial effect. Ultra-violet light, direct sunlight, and cod-liver oil brought production to a satisfactory point. An exposure of 25 minutes daily to ultra-violet light was found to be most satisfactory.

Ultra-violet treatment was started on a pen which had received yellow corn but no light treatment from November 29 to May 5. Production increased from 12 to 43 per cent in 3 weeks. A similar increase, 13 to 54 per cent, resulted in another pen when exposed to direct sunlight. This pen had received white corn. Adding 1 per cent of cod-liver oil to the ration of a pen that had received white corn increased production to 44.7 per cent from March 1 to May 30. Adding sweet butter failed to increase production. The hatchability was no greater in the lots receiving cod-liver oil than in the pens receiving no light.

The relationship between body measurements and egg production in Single Comb White Leghorn fowls, N. F. WATERS (*Poultry Sci., 6 (1927), No. 4, pp. 167–173*).—Two hundred Single Comb White Leghorn pullets in the Storrs (Connecticut) International Egg Laying Contest were used in this study by the Rhode Island Experiment Station. Half of the birds were laying at the time of measuring, and the trap nest records of each bird for one year were available for use in this work. The measurements taken were depth of head, length of comb, width of cranium, length of beak, depth of body, and length of keel. The results indicate that measurements of anatomical characters give negative results when used in an effort to predict egg production.

The fat-soluble vitamin content of hen's egg yolk as affected by the ration and management of the layers, R. M. BETHKE, D. C. KENNARD, and H. L. SASSAMAN (*Jour. Biol. Chem., 72 (1927), No. 2, pp. 695–706, figs. 2*).—The data here presented give a more detailed account of work previously noted (E. S. R., 57, p. 174).

Physical characters of eggs in relation to hatchability, F. A. HAYS and A. H. SUMBARDO (*Poultry Sci., 6 (1927), No. 4, pp. 196–200*).—The eggs from 3 2-year-old hens, 7 yearling hens, and 1 pullet, for which records for 3, 2, and 1 seasons, respectively, were available, were studied from May 1 to July 10, at the Massachusetts Experiment Station, to ascertain the relationship between hatchability and the physical characters of the egg. The contents of the eggs were removed, the shell stained with alcoholic eosin, and the number of pores in approximately 1 sq. cm. of shell from opposite sides of the equatorial regions counted. The thickness of the shell was measured with a micrometer The membranes were removed from the shell, hardened in acetic bichromate, and studied in the above manner.

There was no consistent relation between the hatchability and the following characters: Fresh weight, length, diameter, specific gravity, shell thickness, and outer and inner shell membrane thickness. The authors believe that hatchability is more dependent upon inheritance than upon the physical characters of the eggs, and that selecting hatching eggs upon these characters is to employ an unreliable criterion of their value.

A milkless, greenless, gritless, all-mash ration for growing chicks, C. W. CARRICK, S. M. HAUGE, and R. W. PRANGE (*Poultry Sci., 6 (1927), No. 4, pp. 162–166, fig. 1*).—In this paper from the Indiana Experiment Station the authors propose a ration for growing chicks that supplies the necessary nutrients in adequate amounts for producing growth up to laying time and needs no supplements except direct sunlight and drinking water. This ration consists of 50 per cent of yellow corn, 15 per cent of wheat middlings, 15 per cent of bran, 19 per cent of meat scraps (50 per cent protein), and 1 per cent of salt. It was found that if 6 per cent of dried buttermilk was used to replace 5 per cent of meat scrap and 1 per cent of corn more rapid growth was obtained.

Grow healthy chicks, R. E. Jones (*Conn. Agr. Col. Ext. Bul. 93, rev. ed. (1926), pp. 8, figs. 2*).—Popular directions are given for cleaning and disinfecting equipment and land, together with suggestions on management to prevent the spread among chicks of diseases, especially bacillary white diarrhea and coccidiosis.

Problems of duck egg preservation (*Natl. Poultry Jour., 7 (1927), No. 352, p. 583*).—This is a preliminary report, by F. C. Bobby, on the preservation of duck eggs at the National Poultry Institute, England. The eggs were divided into infertile and fertile and green-shelled and white-shelled classes, and about 400 were put down in water glass. Twenty-five hens' eggs were added to each group to serve as controls. The vessels containing the eggs were kept under normal practical conditions. After 6 months in the solution, the eggs were tested every 14 days until all were 9 months old, when all the remaining eggs were tested for condition.

There was a loss up to 30 per cent of the eggs after 8 months' preservation. The white-shelled eggs showed better keeping qualities than the green-shelled eggs, but there was no apparent difference in the keeping qualities of infertile and fertile eggs. Observations indicated that duck eggs crack more readily than hens' eggs and that the eggs when put down may contain many small cracks. A bacterial test of the duck eggs after 8 months' storage showed two species of the *Bacillus coli* group, while the hens' eggs showed none. The test indicates that water glass is a poor preservative for duck eggs. The author recommends that duck eggs that are to be preserved should be clean and free from cracks, and, if possible, the green-shelled eggs should be excluded from the preservation process.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Missouri Station] (*Missouri Sta. Bul. 244 (1926), pp. 32, 33, 34*).—The results of several experiments are noted.

Studies in milk secretion: (a) Time relations in milk secretion; (b) mechanisms regulating variations in the composition of milk, A. C. Ragsdale, C. W. Turner, S. Brody, E. C. Elting, and W. Gifford.—In continuation of this study (E. S. R., 54, p. 768) an unbred heifer yielded a small amount of very watery secretion after the first and second periods of heat. A spayed heifer of the same age yielded no secretion. The glandular development above the milk cistern of a nonpregnant 3-year-old heifer was limited, and the ducts and secretory tissues extended into the fatty tissue. Milking first-calf heifers and dry pregnant cows at regular intervals showed an increase in secretion during the latter part of pregnancy.

Two-year-old cows were found to be most persistent during lactation. The degree of persistency declined with age up to 5 or 6 years. This is believed to be due to the fact that young animals are growing and developing during the latter part of the lactation period.

The milk in each quarter of a cow's udder was measured at 12-hour intervals for 8 days. The animal was then killed at a regular milking time, the blood drained, and the cow milked. Sixty-nine per cent of the previous yield of milk was obtained after the cow had been killed. In a second trial a cow which had been yielding 10 lbs. of milk for 9 days was killed and the udder removed and milked at once and again at intervals of 0.5 hour until six milkings had been made. The yield was 11.8 lbs. of milk.

Up to 8 years of age milk secretion and increase in body weight in cows on official test increased at the same rate.

Lactobacillus bulgaricus and L. acidophilus fermented milk as substitutes for colostrum to the new-born calf, A. C. Ragsdale, C. W. Weber, and S. Brody.—Two calves removed from their dams at birth were fed milk fermented with *L. bulgaricus* but died from gastritis when 2 days old. Of 3 calves removed from their dams at birth and fed milk fermented with *L. acidophilus,* 2 remained healthy for 40 days, but 1 died from gastritis after 8 days, having been fed for 3 days previous on very sour milk. Bacteriological analysis of the viscera of the dead calves was negative. None died of *Bacillus coli* infection, as is the usual case when colostrum is withheld.

Growth investigations, A. C. Ragsdale, S Brody, and E. C. Elting.—The collection of data on the growth of the Jersey, Holstein, and Ayrshire breeds has been continued (E. S. R., 54, p. 768). These data show that Jerseys mature at an earlier age than Ayrshires and Ayrshires at an earlier age than Holsteins.

A comparison of Welsh and Shorthorn cattle as milk producers, E. J. Roberts (*Welsh Jour. Agr., 3 (1927), pp. 79–83*).—The average yield of 118 Welsh lactations and 114 Shorthorn lactations was 5,780±122 and 5,518±99 lbs., respectively. No significance could be attached to this difference. The Shorthorns had a higher yield during the first 10 weeks after calving, but after that period the Welsh cows overtook them and remained superior to the end of the lactation period. Thirty-seven normal lactations of Welsh cows calving in March, April, and May gave an everage yield of 6,735±202 lbs. of milk, while 42 lactations of cows calving in June, July, and August gave an average yield of 5,435±210 lbs. Thirty-eight normal lactations of Shorthorn cows calving in March, April, and May, gave an average yield of 6,059±175 lbs., while 48 lactations of cows calving in June, July, and August averaged 5,207±132 lbs.

To determine the effect of grass on the yield of Shorthorn and Welsh cows when first turned on grass in the spring, the highest 2-day yield in a 6-week period was determined. These 2 days and the following 5 days were taken as the time of maximum flow. The Shorthorns increased 21.7 lbs. per cow and the Welsh 26.2 per cow. The probable error of the difference was greater than the difference, so no significance could be attached to the difference in the effect of grass upon the milk flow of these breeds.

Cleaning milking machines, R. C. Fisher and G. C. White (*Connecticut Storrs Sta. Bul. 144 (1927), pp. 20, figs. 6*).—The cleaning and sterilizing of the rubber parts of the milking machine is the chief problem in its operation. Trials were conducted employing four methods of sterilization. The agents used were B. K. disinfectant, hot water, steam, and cold running water. A total of about eight weeks was used with each method. Bacterial counts were made of the milk drawn with parts sterilized in the different manners, records were kept of the time consumed in the care of the machines, and observations were made of the effect of the various agents upon the rubber parts. After milking, cold water was drawn through each machine, and this was followed by drawing hot water through the tubes. The equipment was taken apart once a week and cleaned with a brush. The milk pails were sterilized daily with steam.

As previously noted (E. S. R., 56, p. 870), the B. K. solution at usual strength was unreliable in keeping down bacteria. Double strength solution (8 oz. to 10 gal. of water) was suitable if changed twice a week, or if a 4-oz. charge is added every other day. Hot water sterilization at 200° F. for 0.5 hours gave low bacterial counts, and the damage to the rubber parts was not prohibitive in this method. Sterilizing at lower temperatures was not reliable. Steam sterilization, while effective in killing bacteria, was quite destructive to

rubber. Running cold water below 55° was effective, but is not reliable in summer because of the high temperature of the water. Whatever the treatment, the bacterial accumulation in the tubes may be reduced by rinsing in cold water just previous to milking and scrubbing the tubes at least twice a week.

[Dairy experiments at the Porto Rico Station] (*Porto Rico Sta. Rpt. 1925, pp. 2, 3, fig. 1*).—Experiments have indicated that sweet cream butter and several kinds of cheese, notably Cheddar, Swiss, Stilton, and Roquefort, can be made without the use of ice under the conditions which exist at the station.

The deleterious effects of frozen milk on the marketability of milk and cream, W. H. E. Reid (*Missouri Sta. Bul. 244 (1926), p. 35*).—This work has been continued, with results practically identical with those previously noted (E. S. R., 54, p. 771).

Neutralizers and buttermaking, P. S. Lucas (*N. Y. Prod. Rev. and Amer. Creamery, 63 (1927), No. 21, pp. 852, 853*).—The author discusses the use of neutralizers in butter making. Sodium bicarbonate has the advantage of being very soluble, and can, therefore, be made up in exact strengths. It has, however, the disadvantage of being extremely active in exceedingly sour cream, and if added in excess of that required leaves a disagreeable taste of soda in the butter.

Calcium and magnesium hydrate are regarded as the most satisfactory neutralizers. To reduce acidity 0.3 per cent in 100 lbs. of cream, 2 oz. of lime hydrate is required. One gallon of water is added to each 2 lbs. of lime used, and the mixture is added to the cream before pasteurizing. The author recommends the testing of acidity after neutralization as well as before. If the buttermilk is well rinsed out of the butter, the lime content should be low, and in many cases lower than that of average butter.

The manufacture of loaf and blended varieties of cheese, H. B. Davel and D. J. Retief (*Union So. Africa Dept. Agr., Sci. Bul. 58 (1927), pp. 20, figs. 3*).—Directions are given for the making of loaf and soft, spreading types of cheese, by the blending of cheeses already produced in the country. Suggestions are given for regulating the flavor, moisture, acidity, and fat content of these cheeses. The difficulties experienced in the manufacture and methods of eliminating the unfavorable conditions are described.

Production of ice cream with a low bacterial content, F. W. Fabian (*Michigan Sta. Spec. Bul. 159 (1927), pp. 12*).—The author discusses methods of controlling the bacterial content of ice cream. The three sources of contamination, namely, materials, machinery, and persons handling the product are dealt with separately. The physical and chemical methods of sterilization are given in detail. Formulas for several chemical solutions that have been found to be excellent sterilizers are given. Appended are the rules and regulations of the State Department of Agriculture of Michigan governing the manufacture, sale, and storage of ice cream.

Preventing sherbet defects, E. L. Reichart (*Ice Cream Trade Jour., 23 (1927), No. 3, pp. 61, 62, figs. 4*).—In order to overcome difficulties experienced in manufacturing sherbets, tests were undertaken at the Nebraska Experiment Station to determine what factors were involved. Water solutions containing 10, 30, 39, and 50 per cent concentration of beet sugar were prepared to test the effect of air and evaporation on surface crustation. After freezing, samples of each concentration were placed in open and sealed containers and set in the hardening room at 0° F. Daily observations were made, and when an open can showed crustation a closed can was opened. None of the closed cans showed crustation when first opened, even after having been kept 85 days, but after opening they showed rosettes in 48 hours. Open samples of 39 and 50 per cent

concentration showed crustations at the end of 48 hours, but the 10 and 30 per cent concentrations showed no crustations until 96 hours had elapsed. Covering the samples with parchment paper prevented the appearance of rosettes as long as the paper was in contact with the surface of the sherbet.

Tests with stabilizers to prevent crystallization and obtain the proper body showed that when one-fourth of the sugar was corn or invert sugar and combined with agar and gum arabic or India gum satisfactory results were obtained. When the freezer was so equipped that the dasher could remain idle, a mix composed of 20 lbs. of water, 20 lbs. of skim milk, 12.5 lbs. of beet sugar, 3.5 lbs. of corn sugar, and 4 oz. of gelatine made a very desirable sherbet. The same mixture containing 15 lbs. of beet sugar, no corn sugar, and 6 oz. of gelatine showed rosettes in 96 hours. Gelatine is deemed a very satisfactory stabilizer when conditions permit its use.

VETERINARY MEDICINE

Notes on veterinary research in Europe, C. M. HARING (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 1, pp. 9–21*).—This is a contribution from the California Experiment Station, in which the author reports upon studies made in Switzerland, Belgium, Netherlands, and Germany.

[Report of work in veterinary science at the Missouri Station] (*Missouri Sta. Bul. 244 (1926), pp. 58–61*).—In reporting upon studies of abortion reactors in cattle herds, J. W. Connaway, H. G. Newman, and A. Uren refer briefly to retests conducted. During the past 10 years more than 15,000 serological tests were made for abortion disease, the average for the period being 30.22 per cent positive. It is pointed out, however, that only those herds were tested in which abortion was suspected. Evidence of persistent infection in positive reacting animals is given by 5 cows which were infected with *Bacterium abortus* in 1918 and still produce specific antibodies and harbor living organisms in the udder. A positive reaction is considered as evidence of the presence of the living organism in the reacting animal. The results obtained in the feeding of 2 nonreacting pregnant cows with a half portion each of a full term afterbirth from an abortion-reacting cow indicate that the placentas from abortion reactors may vary greatly in their pathogenic properties, the more healthy in appearance being the less dangerous. Reference is made to several cases of abortion in which *B. abortus* was not the cause, but which were possibly due to nutritional deficiencies from the lack of a grain ration.

In considering infectious abortion in swine reference is made to the history of 26 sows and 1 boar, all of which have shown a positive reaction to the serological test. It is concluded that the udder is a favorite and very persistent habitat of the infection in swine, whether virulent or greatly weakened. Work is under way with a view to determining the efficacy of intravenous injections of drugs such as mercurochrome and acriflavines in the destruction of *B. abortus*.

A brief report is given by A. J. Durant on abligation of the ceca by surgical operation as a means of combating enterohepatitis, or blackhead, due to *Amoeba meleagridis*. A description of this operation has been given in an account previously noted (E. S. R., 56, p. 176). In the treatment of blackhead with fluid extract of ipecac, which has been recommended for a number of years, 28 of 70 turkeys in advance stages of the disease recovered. This medicament is considered to be more efficient than indicated by these results, since many of the birds were comatose when the treatment was administered.

Inherited incoordination of the muscles in newly hatched chicks is reported upon by Durant, who states that the infection was first reported from eastern

Missouri in 1922. It is described as a muscular incoordination of the head and neck of newly hatched chicks, characterized by a palsy or short jerky motion of the head. In some cases the head may be drawn backward until it rests on the top of the back or, again, may be drawn to one side as in the case of wry neck. In the most extreme cases of this nature the chicks will topple over backward and are able to sustain their equilibrium only by bracing the body against some object. Excitement or sudden noises or movements increase the severity of the symptoms. The chicks that show signs of this disease appear normal otherwise and will attempt to eat but without success and die from starvation. The disease is transmitted almost exclusively by the male birds, and from 14 to 15 per cent of chicks hatched from matings with males carrying this disease character will be visibly affected. The removal of affected male birds practically eliminates the disease. The disease has been carried through three generations, and birds, both males and females, are available for further studies.

Report of the parasitologist, G. Dikmans (*Porto Rico Sta. Rpt. 1925, pp. 22–24*).—In studying the parasitism of swine, examinations were made of the small intestines of 60 pigs slaughtered at a local abattoir. Of these, 40 per cent harbored a nematode thought to be *Crassisoma urosubulatum* Aless, the individual infestations running from 1 to as high as 800 to 1,000 nematodes. Forty per cent of the 60 pigs were infested with the thorny headed hog worm (*Macracanthorynchus hirudinaceus*). *Ascaris lumbricoides* was found in one animal. The stomachs of 9 of 18 pigs examined contained nematodes, 5 had a double infestation of *Hyostrongylus rubidus* and *Arduenna strongylina*. The few lungs examined showed a high rate of infestation with lungworms, and a few of the large intestines the presence of *Oesophagostomum dentatum*. The feces of one of the animals was heavily infested with *Balantidium coli*, and several showed cysts of amebas.

Casual observation in the slaughterhouse showed a high percentage of infestation of cattle with liver fluke (*Fasciola hepatica*). Lung abscesses due to this parasite were found. Post-mortem examination of a calf showed the presence of ticks in large numbers and all stages of growth, *Syngamus laryngeus* in the larynx and upper part of the trachea, large numbers of lungworms, approximately 4,000 stomach worms (*Haemonchus contortus*) in the abomasum, cattle hookworms (*Bunostomum phlebotomum*), and numbers of Cooperia in the small intestine, whipworms (*Trichuris ovis*), and nodular worms (*Oesophagostomum radiatum*) in the large intestine and cecum, and liver flukes (*F. hepatica*) in the liver.

The author reports having confirmed the findings of the Kansas Experiment Station (E. S. R., 52, p. 683) that pigs may disseminate the hookworm of man, the eggs passing unharmed through the digestive tract of the pig and hatching in the feces.

Studies of skin scrapings by B. K. Ashford, School of Tropical Medicine, San Juan, from two imported Guernsey bulls suffering from skin affections resulted in the finding of a new species of Monilia.

Poisonous plants of Colorado, L. W. Durrell and G. H. Glover (*Colorado Sta. Bul. 316 (1927), pp. 28, figs. 17*).—This is a practical summary of information on the important poisonous plants of Colorado, the information on each form being in the nature of a systematic digest.

Contribution to the study of the subcutaneous injection of oxygen [trans. title], J. Cuillé and E. Darrasped (*Rev. Gén. Méd. Vét., 36 (1927), No. 421, pp. 1–15, figs. 2*).—The authors show that the subcutaneous administration of oxygen is a method of treatment applicable in a large number of affections of the domestic animals.

Adaptation of the bactericidal action of chloroform to the preparation of bacterins, H. Bunyea (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 7*, *pp. 623–630*, *figs. 2*).—In view of the fact that the use of heat in the preparation of bacterins reduces their potency, the author reports upon experiments conducted which show that chloroform kills many nonspore-bearing bacteria with no important modification of their biochemical characteristics. It is pointed out that chemicals such as formaldehyde U. S. P., ether, and possibly toluol might be employed in the preparation of bacterins, but that all are open to some objections. He finds that the passage of 2.5 per cent of chloroform in streaming vapor through a broth culture of *Staphylococcus aureus* will not sterilize it in 10 minutes, or the similar passage of 5 per cent of chloroform in 30 minutes, but that the passage of 4.5 per cent of chloroform will sterilize the culture provided the process is so retarded as to utilize that amount of chloroform in a period of 2 hours and 45 minutes. Attention is called to the fact that it is important not only to pass an adequate quantity of vapor through the culture, but to retard the passage sufficiently to permit of maximum absorption of the vapor by the medium.

A study of colostrum with special reference to the effect of heat (pasteurization) on its physico-chemical, bacteriological, immunological, and nutritional changes, A. C. Ragsdale, C. W. Weber, and S. Brody (*Missouri Sta. Bul. 244* (*1926*), *pp. 32, 33*).—In studies of the transmission of immune bodies from cow to calf in colostrum, it was found that a rapid rise in the bactericidal titer for *Bacillus coli* in the blood serum of all calves took place during the first few days of life and independent of the food ingested. This finding was further substantiated by an analysis of the blood of 2 calves fed colostrum and 3 calves fed *Lactobacillus acidophilus*.

A study was made of the opsonic index of *B. coli* of the blood serum of calves before and after ingesting colostrum and before and after ingesting milk fermented with *L. acidophilus*. The opsonic indexes of the blood of 3 calves fed colostrum showed a marked increase in the opsonic content of their blood serum for an avirulent strain of *B. coli*, while there was a slight increase in the opsonic index of the blood serum of 5 calves which ingested the fermented milk.

In a study made of the growth of *B. coli* in colostrum, the first 4 of 10 samples of colostrum showed a very marked bactericidal action for the stock strain of *B. coli*, and in one case a destruction of more than 10,000 organisms per cubic centimeter in the first hours after inoculation. Later samples showed a marked variation in the bactericidal action for *B. coli*, some samples being an ideal medium for the growth of both the avirulent and virulent strains. Most of the samples of colostrum, however, showed a higher bactericidal action for *B. coli* than control samples of milk. All of 10 samples of milk showed marked bactericidal action for the stock strain of *B. coli*, samples inoculated with as many as 4,000 organisms per cubic centimeter often showing a count of less than 100 organisms per cubic centimeter after five hours' incubation. The virulent strain of *B. coli* always showed growth in the samples of raw milk, but the growth was less rapid than in the inactivated milk samples.

Magnesium ammonium phosphate crystals in aerobic cultures of *Brucella abortus* and *Brucella melitensis*, F. Huddleson and O. B. Winter (*Jour. Infect. Diseases*, *40* (*1927*), *No. 4*, *pp. 476–478*).—This is a contribution from the Michigan Experiment Station.

From observations of the growth of these organisms on the medium here described and from the examination of crystals the authors conclude that the crystals are magnesium ammonium phosphate and that their large size and well-developed shape are due to their slow formation in a semisolid medium

(a gel). The increase in the pH of the medium and the separation of the crystals are due to the formation of ammonia produced by the activity of the organisms in question on the culture medium. The formation of this salt interferes with the viability of *B. abortus* and *B. melitensis*.

Summary of observations of the Commission to Study Foot-and-Mouth Disease, P. K. OLITSKY (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 926–934*).—Some of the more important observations of the commission sent to Europe to study foot-and-mouth disease (see below) are given.

Studies on the physical and chemical properties of the virus of foot-and-mouth disease, I–IV, P. K. OLITSKY and L. BOËZ (*Jour. Expt. Med., 45 (1927), Nos. 4, pp. 673–683, 685–699; 5, pp. 815–831, 833–848*).—Four papers are presented as follows:

I. *Description of the strain of virus used. Titration and centrifugation experiments* (pp. 673–683).—An account is given of a strain of foot-and-mouth disease virus recovered from a cow at the height of the disease and propagated through at least 261 passages in the guinea pig. Considerably over 2,000 animals proved susceptible to the virus, and the virus could be transferred at will back to cattle and hogs, and then again returned to guinea pigs. No natural immunity was discovered in the guinea pig. Secondary lesions were easily and regularly induced, thus making this strain particularly favorable to experimental purposes. The virus was active in dilutions of 1:10,000,000, showing not only the minuteness of the active agent, but also the necessity for a change of technique from that employed with larger sized infectious agents. It was found that the incitant is not sedimented by centrifugation.

II. *Cataphoresis and filtration* (pp. 685–699).—Cataphoresis experiments showed that the virus of foot-and-mouth disease carried, under ordinary conditions, an electropositive charge, its isoelectric range being at the high point of pH=about 8. The filtration experiments confirmed the finding of the electropositive charge of the virus as well as the minuteness of its size.

III. *Resistance to chemicals* (pp. 815–831).—The authors find the virus of foot-and-mouth disease to exhibit a remarkable resistance to such bactericidal agents as the narcotic solvents (alcohol, ether, chloroform), or such antiseptics as phenol, bichloride of mercury, or cresol. They show that the resistance of the incitant to these chemicals is really masked, due to the fact that the reagents coagulate the proteins of the medium in which the virus is, as a rule, suspended. The results of a large series of experiments have led to the conclusion that of a number of antiseptics employed sodium hydrate in 1 to 2 per cent solutions is an effective virucide. It is capable of killing the virus within 1 minute as shown by tests on cattle and guinea pigs, and its effectiveness is not diminished even when the virulent material is admixed with cattle's urine, with manure, or with garden soil. The experimental evidence and its cheapness suggest its use in field practice as a disinfectant.

IV. *Cultivation experiments* (pp. 833–848).—In the authors' investigations no multiplication of the virus in vitro was obtained. The optimum conditions necessary for its preservation in artificial media were determined and are described.

Further observations on foot-and-mouth disease, Sects. A–C, S. P. BEDSON ET AL. (*Jour. Compar. Path. and Ther., 40 (1927), No. 1, pp. 5–36*).—This paper deals with the observations in three parts:

Experimental studies of immunity in guinea-pigs to foot-and-mouth disease, S. P. Bedson, H. B. Maitland, and Y. M. Burbury (pp. 5–28).—Guinea pigs were found to be remarkably regular in developing infection after intradermal inoculation of the plantar pads, although occasional individual variations exist. It was found possible to distinguish clearly marked grades of immunity acquired

by guinea pigs, according to their resistance to inoculation by different routes, and the use of different test doses of virus was found to bring out further gradations. After recovery from infection accompanied by generalized lesions they are immune for several months to reinoculation of the plantar skin with the homologous virus. Their resistance to infection could be increased by intramuscular inoculation of living virus, either alone or mixed with immune serum, in amounts too small to produce lesions.

The survival of the virus of foot-and-mouth disease when dried upon various materials, Y. M. Burbury (pp. 28–33).—Foot-and-mouth virus diluted 1 in 50 and then dried on glass slides survived in a dry atmosphere over sulfuric acid at 18° C. for from 4 months to upwards of a year (4 experiments). Under the same conditions, except that the temperature was 37°, virus diluted 1 in 50 survived 2 to 7 days only (10 experiments). At 18°, in atmospheres 50 and 70 per cent saturated with aqueous vapor, the longest period of survival of diluted virus on glass slides was 5 days (10 experiments). Virus in undiluted, defibrinated blood, dried on glass slides and under the same conditions, survived for approximately the same time as diluted vesicle fluid (4 experiments). Virus air-dried on cotton, silk, and woolen fabrics, kept in a dark cupboard in which the temperature varied between 56 and 60° F. and in an atmosphere of which the percentage saturation averaged 52, survived for periods of from 2 to 14 days (7 experiments), and when dried on cow hair, sand, and salt butter, under the same conditions as the 7 previous experiments, it survived from 2 to 4 weeks (1 experiment each). Virus dried under the same conditions, survived on straw less than 5 days in 1 experiment and 4 weeks in another, when mixed with flour and dried as above, 2 weeks and 7 weeks in 2 experiments, when dried on bran and hay from 8 to 20 weeks (10 experiments), and when dried with extracts of bran and hay for from 15 days to 10 weeks (2 experiments). When the contaminated bran and hay were kept in an atmosphere saturated with water vapor the virus did not survive 5 days. When contaminated materials such as glass and hay were continuously exposed to light which had passed through window glass, the survival of the virus was considerably diminished.

Foot-and-mouth disease in rabbits and rats, Y. M. Burbury (pp. 33–36).—The author's experiments with rabbits and with wild and white rats indicate that while they are susceptible in varying degrees to inoculation with the virus of foot-and-mouth disease obtained from guinea pigs, natural infection, whether by feeding or contact, is rare in captivity.

Researches on the domestic animal carriers of M. melitensis, other than the goat [trans. title], H. Torstensson (*Arch. Inst. Pasteur Tunis, 15 (1926), No. 4, pp. 305–308*).—In the investigations conducted, cats, dogs, guinea pigs, and gray rats kept in contact with infected goats gave negative results, indicating that in nature these animals rarely become infected with *Brucella melitensis*, although susceptible to artificial infection.

[Studies of the piroplasmoses] (*Arch. Inst. Pasteur Algérie, 4 (1926), No. 2, pp. 161–339, pls. 8, figs. 88*).—Papers relating to this subject include: The Diagnosis of the Piroplasmoses, by A. Donatien (pp. 161–221); The Piroplasmoses of the Sheep and of the Goat, by F. Lestoquard (pp. 222–317), which includes a bibliography of some 70 titles; and the Bovine Piroplasmoses Due to Babesiella, a Collective Study with a Description of a New Species, *B. major*, from France, by E. Sergent, A. Donatien, L. Parrot, F. Lestoquard, and E. Plantureux (pp. 318–339), including a bibliography of 21 titles.

Experimental transmission of rinderpest to Cervus aristotelis [trans. title], H. Jacotot (*Compt. Rend. Soc. Biol. [Paris], 96 (1927), No. 14, pp. 1134*,

1135).—The author found that experimentally transmitted rinderpest caused a very benign form of disease in this deer.

The colon-typhoid group of bacteria and related forms: Relationships and classification, J. C. WELDIN (*Iowa State Col. Jour. Sci., 1* (*1927*), *No. 2, pp. 121–197*).—This synopsis includes keys to the genera and species and a bibliography of 10 pages.

Changes in the lungs in anaphylaxis in cattle, S. WALL (*Acta Path. et Microbiol. Scand., 4* (*1927*), *No. 1, pp. 74–83, figs. 7*).—The character of the change which takes place is described as an acute but brief, extensive, serofibrinous pneumonia, complicated by thrombolymphangitis and interstitial emphysema.

Experimental treatment of bovine babesiellosis by hexamethylenetetramine [trans. title], C. CERNAIANU (*Compt. Rend. Soc. Biol.* [*Paris*], *95* (*1926*), *No. 38, pp. 1582, 1583*).—The observations here reported show this drug to be a very effective remedy.

Experiments in the treatment of parasitic gastritis in lambs, A. L. SHEATHER (*Jour. Compar. Path. and Ther., 40* (*1927*), *No. 1, pp. 37–59*).—The experiments reported indicate that a solution of sodium arsenite and copper sulfate is effective for the destruction of stomach worms (*Haemonchus contortus*) in lambs. To insure complete solution these drugs, given in the proportions of 1 : 4, were dissolved in water acidulated with hydrochloric acid. The same combination of drugs is said to be quite ineffective against *Ostertagia circumcincta, O. trifurcata, Trichostrongylus extenuatus, T. instabilis,* and *T. vitrinus.* Some evidence was found to show that copper sulfate alone is effective for the destruction of *H. contortus,* but ineffective for the destruction of other species.

Bacteriological research on contagious pleuropneumonia of the horse in its relation to strangles [trans. title], L. GAUCHER (*Rec. Méd. Vét., 103* (*1927*), *No. 1, pp. 8–23*).—Investigations conducted have led the author to conclude that equine contagious pleuropneumonia is only a form of strangles, it being due to the same pathogenic agent, namely, the diplococcus or streptococcus discovered by Rivolta in 1872. This organism, found present in infected animals, is said to be extremely pathogenic for the guinea pig and the horse. It was found possible through vaccination to obtain a protective immunity.

The vaccinotherapy of strangles and of suppurations of the horse by the antivirus of Besredka [trans. title], I. SADOVSKY (*Compt. Rend. Soc. Biol.* [*Paris*], *95* (*1926*), *No. 36, pp. 1422, 1423*).—The suppurative inflammations so frequent in the course of strangles have been found to yield to the antivirus of Besredka in most cases.

Diseases in poultry (*Rhode Island Sta. Rpt. 1926, p. 46*).—The moving of poults to new ground every week to control blackhead again proved effective (E. S. R., 55, p. 275), less than 10 per cent of the poults succumbing to the disease. The loss of a considerable number of poults was apparently due to bacillary white diarrhea. A brief reference is made to the beneficial results obtained through the use of hypochlorite in the drinking water, an account of which by May and Segelin has been noted (E. S. R., 56, p. 574).

Avian diphtheria and hexamethylenetetramine [trans. title], A. MACHADO (*Compt. Rend. Soc. Biol.* [*Paris*], *95* (*1926*), *No. 37, pp. 1495, 1496*).—The author has found that injections of hexamethylenetetramine (0.6 to 1 gm. per kilogram of fowl), repeated twice at 24-hour intervals, result in the cure of both experimentally and spontaneously infected animals, and it is believed that the drug is specific in this disease.

B. aertrycke infection of chicks, T. M. DOYLE (*Jour. Compar. Path. and Ther., 40* (*1927*), *No. 1, pp. 71–75*).—This is a discussion of an outbreak among

chicks found to be due to *Bacillus aertrycke*, the origin of which was not discovered.

Starlings as distributors of "gapes," E. A. LEWIS (*Jour. Helminthol.*, *4* (*1926*), *No. 2*, *pp. 45–48*).—In examinations made by the author during the period from November, 1925, to February, 1926, of 482 starlings, 35 per cent were found infested with the gapeworm (*Syngamus trachealis*), confirming the author's previous observations when 14 of 38 birds were found infested. The average length of the gapeworm in starlings was found to be much the same as in chickens. It is pointed out that gapes among chickens in Wales occurs in Cardiganshire, Carmarthenshire, and Pembrokeshire from March to August; in young turkeys in May and June; and in adult turkeys and pheasants throughout the year. Thus starlings, turkeys, and pheasants act as a bridging between November to March, when there are few or no young chickens, for the propagation and distribution of the gapeworm. Cases are cited of a sudden outbreak of gapes among chickens in an area where no turkeys have been kept and of heavy losses among pheasants on an estate which starlings had previously frequented in very large flocks. Owing to the higher percentage of infestation and its wider migrations, starlings are considered to be much more effective distributors of the disease than turkeys. Other wild birds, such as pheasants, thrushes, rooks, and jays also play a part in spreading the gapeworm and the disease this worm causes.

Paralysis in fowls [trans. title], T. VAN HEELSBERGEN (*Tijdschr. Diergeneesk.*, *54* (*1927*), *No. 8*, *pp. 360–364*, *figs. 4*).—The author's observations lead him to consider the tapeworm to be the principal cause of paralysis in fowls.

The intradermal reaction in fowl typhoid [trans. title], C. CERNAIANU (*Compt. Rend. Soc. Biol.* [*Paris*], *95* (*1926*), *No. 38*, *pp. 1576*, *1577*).—The author has found the intradermal reaction in fowl typhoid to be specific, fowls reacting to the agglutination test at a dilution of 1 to 100 always giving a positive intradermal reaction.

Fowl typhoid in Rumania [trans. title], C. CERNAIANU (*Compt. Rend. Soc. Biol.* [*Paris*], *95* (*1926*), *No. 38*, *pp. 1575*, *1576*).—A brief account of the virulent form of this disease met with in Rumania.

Rabbit diseases, J. BUNT (*Kansas City, Mo.: Outdoor Enterprise Pub. Co.*, *1926*, *pp. 22*, *figs. 2*).—A brief practical account.

AGRICULTURAL ENGINEERING

[**Agricultural engineering studies at the Missouri Station**], J. C. WOOLEY ET AL. (*Missouri Sta. Bul. 244* (*1926*), *pp. 21–24*, *figs. 2*).—The progress results of investigations of sanitary conditions on farms, of methods of prolonging the service of wood fence posts, of tile draining Missouri soils, and of clearing cut-over lands are presented. Some of the more important results indicated that in general the most effective treatments for wood fence posts were the double tank treatments of creosote. Willow was more favorably affected by treatment than was cottonwood. Data are also briefly reported on the cost of power for operating electrically driven milking machines.

Large springs in the United States, O. E. MEINZER (*U. S. Geol. Survey, Water-Supply Paper 557* (*1927*), *pp. VII+94*, *pls. 17*, *figs. 23*).—Data are presented on the origin and discharge of several of the larger springs in the United States.

Effect of pumping from deep wells on the ground-water table, W. W. WEIR (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 7*, *pp. 663–672*, *figs. 10*).—Studies conducted at the California Experiment Station are reported which dealt primarily with pumping in the San Joaquin Valley.

The results indicated that effective drainage can be obtained for a distance of more than 1,000 ft. from the pump. In order to maintain a constant depth of water table, it is necessary to keep the pump in continuous operation during the pumping season. There was found to be a rapid movement of water through the water-bearing sands and gravels of the region, as evidenced by the rapid recovery of the water table to normal when the pumping was stopped.

Surface water supply of Colorado River basin, 1922 (*U. S. Geol. Survey, Water-Supply Paper 549* (*1927*), *pp. V+175, pls. 2*).—This report, presented in cooperation with the States of Colorado, Wyoming, Utah, and Arizona, gives the results of measurements of flow made on streams in the Colorado River basin during the year ended September 30, 1922.

Surface water supply of western Gulf of Mexico basins, 1923 (*U. S. Geol. Survey, Water-Supply Paper 568* (*1927*), *pp. IV+168, pls. 3*).—This report, presented in cooperation with the State of Texas, gives the results of measurements of flow made on streams in the western Gulf of Mexico basins during the year ended September 30, 1923.

Surface water supply of Hawaii, July 1, 1922, to June 30, 1923 (*U. S. Geol. Survey, Water-Supply Paper 575* (*1927*), *pp. IV+173*).—This report, presented in cooperation with the Territory of Hawaii, contains the results of measurements of flow of certain streams and ditches in the Territory of Hawaii, made during the year ended June 30, 1923.

Clearing land of brush and stumps, G. R. Boyd (*U. S. Dept. Agr., Farmers' Bul. 1526* (*1927*), *pp. II+35, figs. 19*).—This publication, superseding Farmers' Bulletin 974 (E. S. R., 39, p. 687), describes the methods followed in different localities of clearing land of brush and stumps and points out the conditions under which their use is warranted.

Tests of the fatigue strength of cast steel, H. F. Moore (*Ill. Univ., Engin. Expt. Sta. Bul. 156* (*1926*), *pp. 20, figs. 8*).—Studies of the strength of cast steel as a material and of the effective strength of this material in different parts of the casting, modified by internal strains, minute cracks, and foreign inclusions, are reported.

As cast, the steels tested showed a coarse-grained crystalline structure, which could be transformed to a finer grained crystalline structure by suitable heat treatment. The result of such heat treatment was to increase to a marked degree the static tensile strength, ductility, Brinell number, Charpy value, repeated impact value, and fatigue strength of the cast steels. The ratio of endurance limit to ultimate strength was found to average 0.42, which is slightly less than the average value for ordinary rolled steel.

These results are taken to indicate that, under favorable casting conditions and by the use of suitable heat treatment, cast steel can be produced having a strength under either static load or repeated load only slightly less than the strength of rolled steel of similar chemical composition.

Design and control of concrete mixtures (*Chicago: Portland Cement Assoc.,* [*1927*], *2. ed., rev. and enl., pp. 32, figs. 19*).—This is the second edition of this book, which deals with the design of concrete mixtures. It includes a general statement of the factors essential to the economic production of concrete of proper strength and durability. Particular emphasis is placed on the selection of materials, the mixing and placing of concrete, protection during curing, and the importance of proper workability.

Principles of final soil classification, C. Terzaghi (*U. S. Dept. Agr., Public Roads, 8* (*1927*), *No. 3, pp. 41–53, figs. 15*).—In a contribution from the Massachusetts Institute of Technology, the principles of final soil classification for use in the design of engineering structures are presented on the basis of

a large number of studies. The data on which it is propo.ed that the final soil classifications be based give information about (1) the volume change produced by a change of the external pressure which acts on the soil, (2) the speed with which the volume change follows a change of the pressure, (3) the permeability of the soil, (4) the volume change due to drying and wetting under standard conditions, and (5) the consistency of the soil in two extreme states. The conclusion is drawn that the investigations concerning the colloidal character of soil constituents, dye adsorption, base exchange, and the like fall in the same class as investigations concerning the effect of the carbon content and of various alloys on the strength of steel or as analyses of the physical and chemical action in cement during the process of setting.

Highway bridge location, C. B. McCullough (*U. S. Dept. Agr. Bul. 1486 (1927), pp. 32, pls. 6, figs. 26*).—Technical information is presented on highway bridge location, which is adapted primarily for use by engineers.

Experimental determinations of static and impact loads transmitted to culverts, M. G. Spangler, C. Mason, and R. Winfrey (*Iowa Engin. Expt. Sta. Bul. 79 (1926), pp. 60, figs. 48*).—Studies are reported the results of which are taken to indicate that culverts should be designed to carry loads equal to the dead loads upon them from the embankment materials plus from 150 to 200 per cent of $\frac{C_tT}{l}$ to allow for the effect of moving concentrated traffic loads. C_t is the coefficient of transmitted load, T is the total concentrated load applied at one point on the surface of the embankment, and l is the length of the test section of culvert.

It was found that the actual impact blows reaching the culvert tops vary greatly with accidental conditions accompanying the exigencies of actual traffic, weather, and soil conditions. The above allowances are believed to provide safely for the impact effects which may reasonably be expected to occur occasionally, at least for trucks running at speeds up to 10 miles per hour. As with static superloads, the effects of moving superloads are negligible for heights of embankment exceeding 5 ft. for culverts up to 3.5 ft. in width, and above moderate heights for wider culverts.

With reference to static loads, the formula $W_t=\frac{C_tT}{l}$ should be used in designing culverts or conduits through embankments when it is necessary to design for superimposed concentrated loads of a static nature. In this formula W_t is the total corresponding load, per unit of length, transmitted to the top area of the test section. For sizes of culverts up to 3.5 ft. in width, the loads on culverts from concentrated static loads at the surface are negligible in proportion to loads from embankment materials for depths of embankment greater than 5 ft. For culverts wider than 3.5 ft. the depth at which the effect of concentrated loads may be neglected is greater than 5 ft., but will be moderate.

Public Roads, [May, 1927] (*U. S. Dept. Agr., Public Roads, 8 (1927), No 3, pp. 41–60+[2], figs. 21*).—This number of this periodical contains the status of Federal-aid highway construction as of April 30, 1927, together with the following articles: Principles of Final Soil Classification, by C. Terzaghi (see p. 474, and Analysis of Stresses in Concrete Roads Caused by Variations of Temperature, by H. M. Westergaard.

Tractor lug studies on sandy soil.—II, Field studies, J. W. Randolph (*Agr. Engin., 8 (1927), No. 4, pp. 70–75, figs. 8*).—This is the second contribution to the subject from the Alabama Experiment Station, presenting the results of field experiments made to verify the laboratory experiments, previously reported (E. S. R., 56, p. 282). The output-weight ratios were similar for the

test wheel in the laboratory and for tractors in the field. The weight per inch of rim width was found to be proportional to the diameter of the wheel. The depth of angle lugs was proportional to the square of the diameter of the wheel.

It was found that traction is influenced by the weight per inch of rim width, depending upon the lugs and the rim taking full benefit of the arch action of the soil. The drawbar pull, horsepower, and rolling resistance varied directly with the depth of lug.

The tractors tested were found to require a wider rim or deeper lug than standard equipment to obtain their rated power in loose sand. Spade lugs were found to be superior to angle lugs in loose sand when the wheel carried a relatively high unit weight. Lugs which penetrate easily were superior on wheels that carried light loads. The proper spacings of lugs was found to depend upon the arch action value of the soil.

It was possible to express the relation of traction between two wheels by the following formula, provided the weight per inch of rim width is proportional to the diameter of the wheel and the depth of angle lugs is proportional to the square of the diameter of the wheel:

$$O_2 = O_1 \frac{\sqrt{L_2} + D_2 + W_2}{\sqrt{L_1} + D_1 + W_1}$$

in which O is output, D is wheel diameter, L is depth of lug, and W is weight per inch of rim width.

Combines in Illinois, E. W. Lehmann and I. P. Blauser (*Illinois Sta. Circ. 316 (1927), pp. 16, figs. 5*).—The results of investigations of the use of combines in Illinois for threshing are presented.

The results of 24 tests in harvesting soy beans with the combine showed an average total loss of only 8.89 per cent, which included the loss back of the cutter bar as well as the loss from the threshing and separating parts of the combine. The wheat losses were reduced one-third by the use of the combine, and this machine appeared to be superior to any other for harvesting sweet clover seed. The most common size of tractor used to pull the combine in Illinois is the 15–30 h. p. It has been found that for successful use of the combine and in order to produce grain with a low moisture content the grain must stand from 7 to 10 days longer than when cut with a binder. Losses back of the cutter bar are reported as being the heaviest ones in harvesting soy beans with the combine. The amount of loss depends upon the amount of lodging, the height of cut, and the height of the lowest pods on the stems. With a properly adjusted combine on level ground it was found possible to cut as low as 4 in. above the ground. This sometimes made necessary the use of a special low-cutting type of cutter bar.

Weeds were found to cause some trouble especially if they were tall and the soy beans short, since the reel must be set low enough to get the beans and it also gets the weeds. The bar type of cylinder was found to meet the difficulty with bull nettles a little better than the tooth cylinder because the bar cylinder does not mash as many of the berries. Weeds and sweet clover as high as the wheat also caused serious trouble in harvesting small grain because of the difficuty of removing the broken stems from the grain.

It was found that the cylinder speed must be reduced to about one-half of that for threshing small grain to prevent the splitting of soy beans, and at the same time the other parts of the machine should be run at rated speed.

Sweet clover was found to give some trouble in harvesting with the combine because the platform canvas does not readily carry the material. One or two

extra men must be kept back of the platform to force the material down into the machine with heavy brooms. The combines with a separate motor gave better results with sweet clover than those driven by a power take-off.

Grinding farm tools, L. M. Roehl (*N. Y. Agr. Col. (Cornell) Ext. Bul. 155 (1927), pp. 34, figs. 39*).—Practical information on the subject is given.

Electric water heaters for poultry, G. W. Kable and F. E. Fox (*Oregon Sta. Circ. 81 (1927), pp. 15, figs. 7*).—The results of investigations of electric water heaters for poultry are briefly reported.

Pullets drank 25.4 per cent more warmed water than cold water during freezing weather. The water consumption was increased 5 per cent per pullet and 4.2 per cent per 100 eggs laid by warming it during average western Oregon winter weather. It was found that drinking water for poultry may be conveniently warmed with several styles of simple electric heaters. Heaters of from 75 to 100 watts capacity were found to be about sufficient for warming 2 gal. of water. In case of emergency a hermetically sealed soldering iron makes an excellent water heater. Electric lamps may be used for water heating if they are supported close to the under side of the pan and both the pan and lamps protected to avoid heat losses.

Sewage disposal for suburban and country homes (*Va. Health Bul., 17 (1925), No. 6 (rev.), pp. 39, figs. 28*).—Practical information on the planning and construction of sewage disposal systems for suburban and rural homes, adapted especially for conditions in the State of Virginia, is presented.

Domestic smoke and atmospheric pollution, H. Osborne (*Med. Officer, 36 (1926), No. 26, pp. 293–295, fig. 1*).—The results of experiments with open fireplaces bearing on the prevention of atmospheric pollution with smoke are briefly summarized. A comparison was made of the efficiency of ordinary house coal and dry gas coke from vertical retorts, and the tests were conducted in two rooms of similar size and shape and having identical all-fire brick grates.

It was found that the average temperature of the room in which a dry coke was used as fuel was slightly in excess of that supplied with coal. The average daily consumption of dry coke was 14.8 lbs., while that of coal was 21.8 lbs. In practice, to produce the same heating results the weight of dry coke required was roughly two-thirds of that of coal, and the coke gave a radiant fire and no smoke or sulfur fumes. The conclusion is drawn that by burning vertical dry coke in the all-fire brick well grate atmospheric pollution is eliminated and considerable economy effected. As compared with coal, the coke fires begin to warm the room much more quickly and the heat radiation is maintained at a high level for prolonged periods. A much greater proportion of the total heat of combustion is radiated into the room.

RURAL ECONOMICS AND SOCIOLOGY

Rural life (*Missouri Sta. Bul. 244 (1926), pp. 49–51*).—Some of the results of research in agricultural economics and rural sociology for the year ended June 30, 1926, are reported as follows:

The net cost of operating tractors per horsepower hour used was found by B. H. Frame and O. R. Johnson to be 4.18 cts. in 1923, 3.57 cts. in 1924, and 4.24 cts. in 1925. The cost per bushel at the farm in 1925 of producing oats was 52 cts., corn 67 cts., and wheat $1.47, the average yields being 26.5, 29.5, and 13.2 bu., respectively.

A study by E. L. Morgan in 10 counties showed that 8 had lost in both total and rural population during the last two decades. Of the persons moving from farms to towns, 81 per cent were owners and 19 per cent tenants. The average

distance moved was 8 miles. Expressed as percentages of those moving, 59 per cent were leaders in their communities, 64 members of farm organizations, 70 church members, 84 left farms on improved roads, and 88 per cent believed they had gained financially by moving.

A study by Morgan and B. A. McClenahan of rural groups consisting of 8 each of churches, schools, libraries, farm clubs, and community centers, and 6 each of hospitals and small-town chambers of commerce showed that 80 per cent of the unsatisfactory organizations were in towns, the total population of which had declined in the last decade. Loss in rural population and decline in crop yields had been experienced also. Strong competition in the work was experienced in 91 per cent of the groups, and frequent changes of leaders were reported for 54 per cent. The successful organizations had all changed their programs of work radically during the past 3 years and had a decided community service point of view in relation to their work.

Success in agriculture and the methods of its measurement, A. G. Ruston (*Agr. Prog. [Agr. Ed. Assoc., London], 3 (1926), pp. 11–14*).—This is a discussion based upon records from a number of farms of the gross output, as measured by food units and as expressed in money value, and the net or social output as measures of success in agriculture. Gross output, as measured by food units, was found not to be an index of success or efficiency. Neither a high gross output nor a high social output guarantees financial success, but both are essential and may be of value in judging success or failure.

An economic study of truck farming in the Plant City area, Hillsboro County, Florida, B. McKinley and W. C. Funk (*[Fla.] Univ. Rec., 21 (1926), No. 3, pp. 43, figs. 5*).—This contribution is based upon a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics. Records of each year's business and inventories of all farm property at the beginning and at the end of the farm year were obtained by visiting each farmer each fall. Data were obtained from 96 farms for all the 6 years, from 4 farms for 4 successive years, and from 4 others for the other 2 years.

Of the farmers included, 97 per cent owned either all or nearly all of the land operated, and only 5 per cent of the total area operated was rented. The average area of the individual farms was 53 acres. The average area of the 100 farms cropped was 1,896 acres, and recropped 1,308 acres. An average per farm of 1.7 head of work stock, 0.1 colt, 1.5 milch cows, 5 range cattle, 70 hens, and 9 hogs was kept. Tables are given showing the summary of the farm business, tenure, utilization of land, distribution of crop acreages, yields of, prices received for, and receipts from crops, the number of farms growing different crops, fertilizer applied, distribution of receipts and farm expenses, farm wages, distribution of capital, labor income, and items furnished by the farm for the family living.

Analysis made of the data from 83 of the farms operated by the same owners throughout the 6 years showed size of business, price received for products, cropping systems, and crop yields to have been important factors affecting profits. The capital invested per acre decreased from $1,070 on farms of less than 5 acres to $614 on farms of over 20 acres, and the months of labor per acre from 4.5 to 1.6. The farm income, labor, and value of products used for family living increased from $567, $267, and $356, respectively, on the small farms to $3,162, $1,562, and $578, respectively, on the large farms. The farms with a price index (value of actual sales divided by what the sales would have realized had they been made at the average prices received by all the farmers) of less than 95 returned 0.1 per cent on capital; those with an index of 95–114, 6.5; and those with an index of 115 and over, 14.5 per cent. The 29 farms with

the best yields returned an average of 10.9 per cent on capital invested, as compared with 1.1 per cent for the 27 farms with the lowest yields.

A study of the cost of producing tobacco in Kentucky, W. D. NICHOLLS (*Kentucky Sta. Bul. 275 (1926), pp. 455–526, figs. 18*).—This study, a preliminary report of which has been previously noted (E. S. R., 45, p. 42), is based on data collected for the years 1919–1922 on from 43 to 89 farms, totaling 287, in the Burley district, and from 47 to 97 farms, totaling 264, in the dark tobacco district of Kentucky.

In the Burley district, the averages for the several years for important items varied as follows: Acres in tobacco from 6.4 to 8.5, averaging 7.7; yield per acre 908 to 1,141 lbs., averaging 1,064 lbs.; sales per acre $136.67 to $665.77, averaging $355.76; price per pound 15.1 to 58 cts., averaging 33.5 cts.; cost per acre, including rent, $172.01 to $299.05, averaging $238.30; cost per pound 15.8 to 32.9 cts., averaging 22.4 cts.; profit per acre from a loss of $162.38 to a profit of $376.67, averaging a profit of $118.46; profit per pound from a loss of 17.8 to a profit of 32.7 cts., averaging a profit of 11.1 cts.; return per 10-hour days' work from a loss of $1.41 to a profit of $13.30, averaging a profit of $6.34; man labor per acre 297 to 375 hours, averaging 330.4 hours; and horse work per acre 90.4 to 102.7 hours, averaging 97.6 hours.

Man labor comprised 38.27 per cent of the total average cost for the four years, horse work 7.14, barns and sticks 11.87, machinery 1.06, manure and fertilizer 0.50, insurance 2.76, use of land 36.66, and other costs 1.74 per cent. The average returns to tenants varied from $8.02 per 10-hour day worked in 1919 to $1.09 in 1920, averaging $4.63 for the four years; and the returns to landlords varied from $296.32 to $24.49 per acre, averaging $144.14. The yield per acre on the 10 farms with the highest profits varied during the four years from 1,215.1 to 1,538.9 lbs., the cost per acre from $163.60 to $310.03, the cost per pound from 11.8 to 25.5 cts., and the profits per acre from a loss of $41.74 to a profit of $807.11. On the 10 farms with the lowest profits, the variations were yield per acre from 615.2 to 957.9 lbs., cost per acre from $170.44 to $289.40, cost per pound from 17.8 to 47 cts., and the losses per acre from $29.45 to $230.04.

In the dark tobacco district the averages for the several years for important items varied as follows: Acres in tobacco from 7.4 to 11, averaging 9.4; yield per acre 745 to 865 lbs., averaging 794 lbs.; sales per acre $103.52 to $155.36, averaging $124.48; price per pound 12.1 to 18.8 cts., averaging 15.7 cts.; cost per acre $79.63 to $141.76, averaging $105.44; cost per pound 10.7 to 17.2 cts., averaging 13.3 cts.; profit per acre from a loss of $23.60 to a profit of $43.64, averaging $19.04; profit per pound from a loss of 2.8 to a profit of 5.3 cts., averaging 2.4 cts.; return per day's work from $1.64 to $3.53, averaging $2.79; man labor per acre from 239.4 to 276.1 hours, averaging 262.03 hours; and horse work per acre 79.4 to 90 hours, averaging 84.3 hours.

Man labor comprised 49.21 per cent of the total average cost for the four years, horse work 13.02 per cent, barns and sticks 8.49, machinery 1.97, manure and fertilizer 3.79, insurance 3.65, use of land 15.88, and other costs 3.99 per cent. The average returns to tenants per 10-hour day worked varied from $2.64 in 1919 to $1.37 in 1920, averaging $2.24 for the four years. The returns to landlords varied from $39.70 to $23.55 per acre, averaging $31.26.

On the 10 most profitable farms during the four years, yields varied from 969.9 to 1,083.7 lbs., cost per acre from $89.62 to $147.17, cost per pound from 8.3 to 13.9 cts., and profit per acre from $32.13 to $132.31. On the 10 farms having the lowest profits, yields varied from 483 to 535.2 lbs., cost per acre from $82.01 to $133.94, cost per pound from 16.3 to 26.8 cts., and the loss per acre from $29.35 to $100.82.

The largest factors in both districts affecting costs and profits were yields and prices received. A study of the methods and results indicates that limitation of the tobacco acreage to lands correctly cropped and handled in previous years, and painstaking and skillful work in production, housing, grading, stripping, and marketing are of especial importance in obtaining satisfactory yields and prices. Numerous tables and graphs are included presenting the data for the various factors entering into costs, returns, and profits.

Report on the cost of production of maize: Investigation for the season 1923–24, D. W. McKellar (*Union So. Africa Dept. Agr., Sci. Bul. 52 (1926), pp. 28, figs. 11*).—A report for the third season of the investigations previously noted (E. S. R., 55, p. 182).

The relation of labour cost to total costs of production in agriculture (*Internatl. Labor Off. [Geneva] C. E. I. 27 (1926), pp. 66*).—This is a documentation for the International Economic Conference held at Geneva, May 4, 1927, covering investigations in Australia, Canada, Denmark, France, Germany, England, Scotland, Irish Free State, Italy, Netherlands, Poland, Sweden, Switzerland, and the United States.

The difficulties arising out of the employment of different methods in obtaining data, different definitions of reward, net output, costs, interest, rent, and labor, and the payment of labor are discussed.

Scientific management of agricultural labour, its development in Germany, and its international importance, W. Seedorf (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 4, pp. 743–755*).—A brief account of the research that has been done in the field of scientific management of agricultural labor, and of some of the problems in that field needing investigation.

Report of proceedings under the Agricultural Wages (Regulation) Act, 1924 (*[Gt. Brit.] Min. Agr. and Fisheries, Rpts. Proc. Agr. Wages (Regulat.) Act, 1924–25, pp. 62; 1925–26, pp. 61*).—These reports cover the periods August 7, 1924, to September 30, 1925, and October 1, 1925, to September 30, 1926, and set forth the actions taken by the agricultural wages committees on minimum rates for different types of workers and kinds of work, exemptions, changes in agricultural wages, state of employment and demand for labor, and cost of administering the act. Appendixes give schedules of minimum, overtime, and special rates; benefits or advantages which may be reckoned in part payment of minimum rates; a summary regarding permits of exemption; tables showing prevailing wages, 1918–1925; and tables showing areas of several agricultural wages committees.

Report of the inter-departmental committee on agricultural unemployment insurance (*London: Min. Agr. and Fisheries and Scot. Off., 1926, pp. 107*).—Included are the majority and minority reports of the interdepartmental committee appointed to consider and report on the desirability of compulsory insurance of agricultural workers against the risk of unemployment, and, if found desirable, the terms and conditions and most effective manner for providing such insurance.

The majority found compulsory insurance of agricultural workers to be desirable and practicable, but that the present unemployment insurance act is not applicable to agriculture. It recommended new legislation providing for a scheme based on contributions by employers, workers, and the State, and to be administered by the Minister of Agriculture. The minority recommended against such insurance.

Absentee farm ownership in the United States, H. A. Turner (*Jour. Land and Pub. Utility Econ., 3 (1927), No. 1, pp. 48–60*).—This study is based upon

the 1900 agricultural census of the U. S. Bureau of the Census and a study made by the U. S. D. A. Bureau of Agricultural Economics of about 250,000 farms in 184 counties in 24 States shown by the 1920 agricultural census to have been rented.

Tables are given and discussed showing the following: (1) For 1900, by groups the average acreage and value per acre of farms owned by landlords resident in the same county, other counties in the same State, and outside the State; by groups and States the percentage of the number of farms, acreage, and value of lands and buildings owned by landlords not resident in the same county; by States the extent of ownership of cash and of share rented farms by nonresidents of the county; and a comparison of the extent that landlords resident in the county and nonresident of the State rented for cash. (2) For the 184 counties in 1920, by groups the percentage of farms, acreage, and value of lands and buildings of farms owned by landlords not resident in the same county or in adjoining counties, resident within three miles of the farms, and resident on farms and in towns or cities of less than and over 5,000 population; and by States the percentage of farms owned by residents out of the county, out of the county and the adjoining counties, and out of the State, and the number of counties having different percentages of farms owned by nonresident landlords.

Symposium on Iowa land value appraisals (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 4, pp. 385–407*).—Included are the following articles: Comparative Farm-Land Values in Iowa, by H. A. Wallace; The Appraisal of Iowa Farm-Land Values by an Insurance Company, by G. Johnson; and The Principles Involved in Farm-Land Appraisal Procedure for Loan Purposes, by A. G. and J. D. Black.

Reform of the agricultural land system of Great Britain, J. P. Maxton (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 4, pp. 454–466, fig. 1*).—This article describes the elements of the tenancy system making it of economic value to English agriculture, and develops the argument for the scheme of nationalization of land previously noted by Orwin and Peel (E. S. R., 54, p. 586).

The development of public land policy in Australia, W. H. Wynne (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 4, pp. 441–453, fig. 1; 3 (1927), No. 1, pp. 21–31, fig. 1*).—The first article outlines the history of the Australian land policy down to 1884, when the Free Selection Act was repealed. The second article discusses the land legislation since 1884.

The Federal intermediate credit system, C. L. Benner (*New York: Macmillan Co., 1926, pp. XVIII+375, figs. 2*).—This volume, of the series of the Institute of Economics, includes the results of a study made to explain the causes giving rise to the passage of the Agricultural Credits Act of 1923 (42 Stat. 1454), and to show the place and function of and the modifications in rural banking practice brought about by the new rural credit agencies established by this act.

Financing the livestock industry, F. M. Larmer (*New York: Macmillan Co., 1926, pp. XVI+327*).—This volume is one of the series noted above. It outlines the evolution of the livestock industry, with major emphasis on the economic organization, describes the way the industry has been financed at different stages, and analyzes the present situation and the needs for more suitable economic organization and permanent provision for financing. The Federal Intermediate Credit system in its relation to the livestock industry is discussed at some length.

The financing of non-governmental irrigation enterprises, R. P. Teele (*Jour. Land and Pub. Utility Econ., 2 (1926), No. 4, pp. 427-440*).—The historical development of nongovernmental irrigation enterprises is described briefly. The defects of the Carey Act and the weaknesses of the irrigation district legislation of different States are pointed out, and the security back of irrigation bonds and the proposals for remedying the weaknesses of the district plan are discussed.

Mutual irrigation companies in Utah, W. A. Hutchins (*Utah Sta. Bul. 199 (1927), pp. 51*).—The results of a study of the history, operation, and utility of mutual irrigation companies, including incorporated companies and unincorporated associations in Utah, are presented. The study was made in cooperation with the U. S. D. A. Bureau of Public Roads.

Cooperative buying and selling among farmers, H. A. Hanemann (*Penn. Dept. Agr. Bul. 429 (1926), pp. 39, figs. 13*).—The growth, accomplishments, financing, and operation of cooperative buying and selling organizations in Pennsylvania are described, and the essentials for success of such organizations are discussed. The appendix includes the text of the act of 1919 covering the incorporation and regulation of cooperative agricultural associations without capital stock and not conducted for profit.

Marketing attitudes of Minnesota farmers, C. C. Zimmerman and J. D. Black (*Minnesota Sta. Tech. Bul. 45 (1926), pp. 54, figs. 6*).—The purposes of the study reported in this bulletin were to discover the attitudes of Minnesota farmers toward marketing problems, particularly cooperation; to discover the genesis of these attitudes; and to point out their significance in programs of organization and education in the field of marketing. The study was made by the survey method in nine communities representative of the principal agricultural areas of the State, a total of 345 farmers being interviewed. This sample includes about one out of every 80 farmers in the 10 counties in which the communities were located, and the authors deemed it perhaps 10 per cent above the average, due to the methods of selecting the farmers. Data were obtained as to the farm business, farming experience, land tenure history, education, reading habits, social and political history, cooperative experience of the farmers interviewed, their attitudes regarding certain marketing institutions and practices and other economic and social phenomena, the farmers' own explanations of their behavior on attitudes, the explanation of the farmers' attitudes by community advisers, and an analysis of the social problems of marketing by local leaders in each community. The term "attitude" as used by the authors means "simply an opinion or point of view on a subject, expressed or defined in response to a direct question."

The communities surveyed and the marketing and other institutions considered are described. Data on what farmers know about marketing agencies and their attitudes toward cooperative and private marketing agencies, and toward the Farm Bureau Federation, the Nonpartisan League, and the tariff are discussed.

The following table shows the percentages of the 345 farmers interviewed who expressed no attitudes in regard to different cooperative marketing practices and who favored the various practices.

Table showing percentages of farmers expressing no attitudes toward and favoring certain cooperative marketing practices

Problem	Percentage expressing no attitudes	Percentage favorable
Cooperative selling	------	79.0
Cooperative buying	13.9	89.3
Use of membership contracts	8.4	81.4
Length of contract	15.7	[1]
Use of a withdrawal clause	6.4	85.2
Use of stock versus nonstock organization	35.0	44.4
Handling produce for nonmembers	4.2	58.0
Pooling versus cash payments	11.5	84.7
Federated versus localized and centralized organization	16.8	51.2
Central control of grading	19.1	61.8
Central control of selling	19.1	81.7
Local control of manager	18.5	58.0
Central control of quality of production	7.3	76.2
Central control of quantity of production	7.9	48.2
Advertising by central organization	19.7	66.1
Supply and demand price	15.6	41.7

[1] Of the 212 favoring membership contracts, 25.9 per cent favored a term of less than 5 years, 27.2 per cent a term of 5 years, 16.1 per cent a term of over 5 years, and 30.8 per cent expressed no opinion as to term or favored variations.

Attitudes favorable toward cooperative selling increased with cooperative experience, 16 per cent of the farmers with no experience, 73 per cent with from 1 to 5 years' experience, 82 per cent with 6 to 10 years' experience, 91 per cent with 11 to 15 years' experience, 95 per cent with 16 to 25 years' experience, and 100 per cent with 26 to 35 years or over being favorable toward cooperative selling. A table is included showing the relationship between cooperative experience and the percentages favoring certain marketing practices.

Some of the more fundamental conclusions relating to the essential nature of rural social psychology given are (1) that rural attitudes are of two classes, those concerning subjects with which the farmer has had actual experience, and those toward subjects, such as the tariff, with which the farmer has had no actual experience; (2) that farmers in each community and communities vary in attitudes toward the same concept; (3) that social life in different communities is founded upon biological and environmental differences; (4) that different types of behavior are attributable to the same motive, and identical behavior to different motives; (5) that structure of previous experience and thinking, actual experience, business conditions, geographic distance, social distance, extreme wealth, poverty, and old age are factors affecting attitudes; (6) that farmers in general think and behave according to the same social principles as other people; and (7) that the common belief that farmers are individualists is a fallacy.

The authors conclude as to cooperation that wherever possible it should be a growth and not a spasm, that close contact between members and the organization is highly desirable, that voluntary cooperation is more likely to succeed than legal coercion, that education in cooperation is vital to success in the long run, that careful consideration must be given to methods for retaining the support of members, that the avenues for withdrawal should be left open, that the business of a cooperative is the business of a community, that cooperatives should not be oversold at time of organization, and that the organization must be simple.

The study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Report on fruit marketing in England and Wales (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 15 (1927), pp. VI+152, pls. 37, fig. 1*).—This report is the fifteenth of the series previously noted (E. S. R., 56, p. 387), and was prepared to provide growers with a comprehensive view of the methods of marketing fruit. The home production, importation, prices, preparation for market, assembling, conservation, transportation, distribution, advertising, and associations and federations of growers, wholesalers, and retailers are discussed.

Crops and Markets, [June, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), No. 6, pp. 193–232, figs. 3*).—The usual tabulations, summaries, charts, and notes. An article on the cost of producing corn, wheat, oats, potatoes, and cotton in 1926, and the unload statistics for 16 kinds of fruits and vegetables in 36 cities during 1926 are also included.

The new social research, E. S. Bogardus (*Los Angeles: Jesse Ray Miller, 1926, pp. 287, figs. 4*).—The methods used in the Pacific Coast race relations survey, conducted in 1923 to 1925, and in the boys' work survey of Los Angeles during 1924–25 are presented. Chapters are included on exploration, organization, the personal, the group, and the research interview, the life history, life history types, the diary and the letter, interpreting personal experience, measuring social distance, analyzing community organization and opinion, public opinion, and changes in public opinion, and on the research laboratory and clinic.

A short survey of agriculture in Denmark, H. Hertel (*Copenhagen: Bianco Luno, 1925, pp. 69, figs. 3*).—This pamphlet was published by the Royal Danish Agricultural Society to give foreign visitors information regarding the agricultural conditions of the country. Vital agricultural facts and statistics, and descriptions of the distribution of landed property, agricultural tenure, taxation of agricultural lands, agricultural credit, associations, cooperation and education, and small-holders legislation, are included.

The pamphlet is also published in German, French, and Danish.

The organisation of German agriculture, A. Schindler (*Scot. Jour. Agr., 10 (1927), No. 2, pp. 144–155*).—A brief description of the formation and functions of organizations existing for the technical and economic promotion of agriculture and for political representation of agricultural interests. The greater part of the article is devoted to the agricultural chambers and their covering organizations and the German Council of Agriculture organized to deal with the Government.

The agrarian problem in Poland, A. Rose (*Le Problème Agraire en Pologne. Warsaw, 1926, pp. 57+[1]*).—A brief discussion of the agricultural conditions at the beginning of reconstruction in Poland; of the measures taken between 1919 and 1925 to abolish servitudes on lands, to consolidate holdings, and to parcel out large holdings; and of the new agrarian law of December 28, 1925.

Report on the sugar industry (*Union So. Africa Bd. Trade and Indus. Rpt. 66 (1926), pp. [2]+50, pls. 2*).—A report of the board of trade and industries inquiry made in 1925 of the economic conditions governing the sugar industry. Recommendations designed to stabilize and develop the industry and to protect the South African consumer from exploitation are embodied. A chemical engineering report covering the industry in Natal and Zululand is included.

The rural industries of England and Wales.—II, Osier-growing and basketry and some rural factories. III, Decorative crafts and rural potteries, H. E. FitzRandolph and M. D. Hay (*Oxford: Clarendon Press; New York: Oxford Univ. Press, Amer. Branch, 1926, vol. 2, pp. [XII]+159, pls. 9; 1927, vol. 3, pp. [XII]+168, pls. 9*).—In the second of the series previously noted (E. S. R., 56, p. 487), chapters on osier-growing and basket-making; rush, sedge, and reed industries; straw skeps; the peat industry; outwork for

factories; and some small rural factories of different kinds are included. In the third of the series hand-loom weaving, dyeing, and spinning; lace-making; home crafts and industries; rural potteries; lapidary workers; and the Brandon flint knappers are considered.

The agricultural output of England and Wales, 1925 (*London: Min. Agr. and Fisheries, 1927, pp. XV+152, pls. 26*).—This is a report on certain statistical inquiries made in connection with the Census of Production Act, 1906. It includes, besides a brief survey of agricultural statistics up to 1925, tables, maps, diagrams, and text on the utilization of the land, production of different crops, number and distribution of livestock, livestock products, value of the agricultural output, number and size of holdings, employment and wages in agriculture, motive power on farms, rent and the capital employed in agriculture, and agricultural prices.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

New developments in agricultural education (*Agr. Prog. [Agr. Ed. Assoc., London], 3 (1926), pp. 61–78*).—A series of short articles on The National Institute for Research in Dairying, by R. S. Williams; Institute of Animal Pathology, Cambridge, by J. B. Buxton; The National Poultry Institute, by C. Crowther; New University Buildings, by R. G. White and T. B. W.; Dairy Education in Cheshire, by W. B. Mercer; The Dairy at the Moulton Farm Institute, Northants, by J. W. Strang; The Hostel at the Sparsholt Farm Institute, Hampshire, by L. G. Troup; Avoncroft: A Residential College for Rural Workers; Agricultural Scholarships, by H. A. D. Neville; and A New Journal for Wales.

Scheme for establishing scholarships and maintenance grants for the sons and daughters of agricultural workmen and others (*London: Min. Agr. and Fisheries, 1927, pp. 62*).—This is a report of the central committee on the working of the scheme during the 5-year experimental period under the Corn Production Acts (Repeal) Act, 1921. The types of scholarships, qualifications required, procedure in selecting scholars, institutions to which scholars were sent, progress of scholars and results of training on their careers; and the cost of the scheme are discussed, and recommendations made for its continuance with certain modifications.

During the 5-year period 2,574 applications were received, of which 1,264 were found to be within the scheme. Three classes of scholarships were awarded as follows: Class 1, in university departments of agriculture providing 3- or 4-year courses leading to degrees in agriculture, horticulture, and veterinary medicine, 43 men and 6 women; class 2, in agricultural colleges with 2- or 3-year courses leading to diplomas in agriculture, horticulture, dairying, and poultry-keeping, 41 men and 14 women; and class 3, in farm institutes with short courses in agriculture, horticulture, dairying, or poultry-keeping, 345 men and 163 women. About £40,000 will be expended on class 1 scholars, £20,000 on class 2 scholars, and £46,500 on class 3 scholars.

[Training for leadership in vocational education] (*Fed. Bd. Vocat. Ed. Buls. 114 (1927), pp. III+29; 115, pp. III+30; 116, pp. III+33*).—Bulletin 114, Training for Leadership in Trade and Industrial Education, contains a report of the special committee on trade and industrial education on training for leadership in that field; Bulletin 115, Training for Leadership in Agricultural Education, a report of the special committee on agricultural education, setting forth a proposed program of advanced professional courses in vocational education in agriculture; and Bulletin 116, Training for Leadership in Home Economics Education, a report of the special committee on home economics education on training for leadership in that field. Each bulletin also contains a statement

as to the origin, membership, and organization of the committee on advanced courses in vocational education and a report of the committee of State directors on training for leadership in vocational education.

Farm household management instruction in the Netherlands, S. L. Louwes (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 4 (1926), No. 4, pp. 517–531, pls. 3, figs. 3*).—Under the Law on Technical Instruction of 1919, farm household management instruction is placed under the Department of Education. The instruction is carried out through the medium of private institutions, such institutions appointing the teaching staff, subject to approval by the Government, and fixing the curriculum. The Government meets 70 per cent of the expenditure and the communes 30 per cent. Money contributions have also been made by individuals and by provinces. The location of the schools giving instruction in farm household management, the instruction at the Government Farm Household Management School at De Rollecate, and the curriculum of one of the more and one of the less extensive courses are described.

The forest: A handbook for teachers, D. P. Edgerton (*U. S. Dept. Agr., Misc. Circ. 98 (1927), pp. 72, pl. 1, figs. 31*).—Seasonal outlines are given for primary grades and for grades from the fifth to the ninth, and for simple experiments. Suggestions and information are included for field trips, collecting and arranging specimens, preparing maps, etc., and for supplementary reading.

Agricultural project planning, A. P. Williams (*Fed. Bd. Vocat. Ed. Bul. 117 (1927), pp. VII+19, fig. 1*).—This bulletin "deals with the making of plans by pupils for the more highly organized forms of supervised practice known as farm enterprise projects." It is specifically directed to vocational teachers of agriculture, to agricultural teacher trainers, and to State supervisors of agricultural education, and supplements Bulletin 112, previously noted (E. S. R., 55, p. 888).

Social statistics, M. C. Elmer (*Los Angeles: Jesse Ray Miller, 1926, pp. 306, figs. 40*).—This text was written to give a compact outline of elementary statistical methods useful to students of sociology and social work. It contains chapters on the problem of social statistics, and the sources, classification, presentation, analysis, and comparison of data.

FOODS—HUMAN NUTRITION

Quantitative research in the chemistry of nutrition, H. C. Sherman (In *Contemporary Developments in Chemistry. New York: Columbia Univ. Press, 1927, pp. 19, figs. 5*).—This lecture, delivered in the special course given at Columbia University in the summer of 1926, furnishes convincing proof, chiefly from investigations in the author's laboratory on enzymes and vitamins, that strictly quantitative methods can be applied in the investigation of problems in the chemistry of nutrition and that it is only by such methods that individual variations can be ruled out and definite conclusions drawn.

In illustration of quantitative biological studies on nutrition, feeding experiments of two types are discussed: (1) Those in which the variable is a single chemical factor and (2) those in which the original experimental variables are the articles of food upon which people and other animals subsist in actual life. The former is illustrated by the various vitamin studies which have been reported from the author's laboratory, and the latter by the long-continued comparison of the one-third milk, two-thirds wheat diet with the one-sixth milk, five-sixths wheat diet. The evidences of better nutrition and higher degree of health and vitality on the diet furnishing the larger amount of milk,

which become more and more apparent with succeeding generations, have shown that "differences between adequate and optimal nutrition can not only be detected but measured. Not only is the problem amenable to quantitative study, but it is only through quantitative research that findings such as those which we have just been discussing could have been established, for qualitatively the results of the two diets were alike adequate. And since the results on both diets are adequate in the average and variable in individual cases, a comparison might easily yield a misleading result if made on anything less than large numbers and in anything less than the most quantitative way both as to the actual measurements and the statistical interpretation of the data."

Equipping a laboratory for home economics research, M. L. Cammack (*Food Facts, 3 (1927), No. 1, pp. 22, 23, 40, 41, figs. 2*).—This description of the small laboratory which has been installed at the University of Arizona for research in foods and nutrition contains useful suggestions as to the arrangement of furniture, plumbing, and wiring in such a laboratory and the selection and estimated cost of the portable equipment considered essential.

Acid- and base-forming elements in foods: A correction, G. W. Clark (*Jour. Biol. Chem., 73 (1927), No. 2, p. 389*).—Attention is called to an error in the figure given for the nitrogen content of eggs in the paper previously noted (E. S. R., 54, p. 891). "This figure (7,767 mg.) represents the nitrogen content of the dried material and should be divided by 4.57, giving 1,700 mg. of nitrogen per 100 gm. on the 'as eaten' basis."

Indole derivatives in connection with a diet deficient in tryptophane, R. W. Jackson (*Jour. Biol. Chem., 73 (1927), No. 2, pp. 523–533, figs. 8*).—The growth of white rats on a diet deficient in tryptophane was not appreciably influenced by the addition of either 3-indole aldehyde or l-β-3-indole lactic acid. Tryptophane in amounts satisfying the requirement for growth when administered orally was ineffective when injected subcutaneously over 12-day periods.

The metabolism of sulfur.—XII, The value of diglycyl-cystine, dialanyl-cystine, and dialanyl-cystine dianhydride for the nutritive requirements of the white rat, G. T. and H. B. Lewis (*Jour. Biol. Chem., 73 (1927), No. 2, pp. 535–542*).—In continuation of the series of studies previously noted (E. S. R., 57, p. 194), two cystine-containing dipeptides, diglycyl-cystine and dialanyl-cystine, and the 2, 5-diketopiperazine derived from dialanyl-cystine, dialanyl-cystine dianhydride, have been tested for their ability to replace cystine in the nutrition of young rats. Growth was satisfactory with the dipeptides but not with the dianhydride. The failure of this compound is thought to be due not to failure of absorption from the alimentary canal but possibly to failure of cleavage of the piperazine linkage.

Sources of mineral in the diet of pre-school children, H. McKay (*Ohio Sta. Bimo. Bul., 12 (1927), No. 3, pp. 99–101*).—A summary of the study previously noted (E. S. R., 56, p. 493), with practical suggestions for the improvement of the institution diet by the use of entire in place of highly milled cereals.

Fat-soluble vitamins (*Nature [London], 119 (1927), No. 3004, pp. 787, 788*).—A review of recent literature on vitamins A and D, particularly the studies leading to the discovery that ergosterol is a precursor of vitamin D.

A study of the effect of heat and oxidation on cod-liver oil as measured by colour tests, F. Wokes and S. G. Willimott (*Biochem. Jour., 21 (1927), No. 2, pp. 419–425, fig. 1*).—The earlier conflicting literature on the destruction of vitamin A by heat and oxidation is reviewed briefly, and a study is reported of the effect upon the vitamin A content of cod-liver oil of aeration at different temperatures above and below 100° C., using color tests as a measure of the

content of vitamin A. As in earlier studies along the same line (E. S. R., 56, p. 410), qualitative tests were first made with the four color reagents concentrated sulfuric acid, phosphorus pentoxide, arsenic trichloride, and antimony trichloride, followed by quantitative tests with arsenic trichloride and antimony trichloride, using a Lovibond tintometer. About 50 cc. of a potent sample of Norwegian cod-liver oil was first heated in a boiling water bath until the temperature of the oil became constant at 97 to 98°, after which air was drawn through at the rate of 4 to 6 bubbles per second for 75 minutes. Small samples of the oil were withdrawn at 5-minute intervals and tested. The tests became negative with all reagents at 75 minutes and much earlier with the concentrated sulfuric acid and phosphorus pentoxide. From quantitative tests with antimony trichloride and arsenic trichloride at this temperature and also at 88, 108, 118, and 125° the time required for complete destruction of the vitamin A in cod-liver oil by aeration was found to be 105 minutes at 88°, 75 at 98, 50 at 108, 35 at 118, and 30 at 125°. The temperature coefficient for the destruction as calculated from these data was between 1.4 and 1.5 for each 10 degrees rise between 88 and 125°. Blank tests run with oil heated at the same temperature but not aerated showed very slight destruction, increasing with the temperature.

The results of a preliminary series of tests applied to the oils after aeration indicated that the destruction of vitamin A is probably due to volatile organic peroxides. This is considered of interest in connection with the previous suggestion that the distribution of vitamin A in the citrus fruits may be related to the presence of peroxidases (E. S. R., 56, p. 409).

Water-soluble vitamins, E. V. McCollum (In *Contemporary Developments in Chemistry. New York: Columbia Univ. Press, 1927, pp. 10*).—In this lecture, delivered in the series referred to on page 486, the author traces development in the knowledge of the antineuritic vitamin and vitamin B leading up to the present conception that what has hitherto been known as vitamin B contains at least two substances, the heat-labile antineuritic vitamin and the heat-stable vitamin probably involved in the prevention of pellagra, both of which are indispensable to normal nutrition.

Determination of the vitamin B requirement of the pigeon and its bearing on the theory of vitamin B function, G. R. Cowgill and B. H. Klotz (*Amer. Jour. Physiol., 81 (1927), No. 2, pp. 470, 471*).—In this brief summary of an extension of the studies on the vitamin B requirement of different species (E. S. R., 55, p. 295) it is stated that "the vitamin B requirement of the adult bird is in linear relationship to the 5/3 power of its body weight. This may provisionally be regarded as a function of the product of the body weight and the number of calories metabolized per day. Stated a bit differently the vitamin B requirement appears to be conditioned mainly by the mass of the tissue (weight) and the total metabolism of that mass in unit time (calories per day).

"The tentative vitamin formula previously suggested has been simplified. The data from the pigeon, rat, and dog agree very well with the simplified expression, whereas those for the mice fit the older formula better. Inasmuch as the error of method was greatest where mice were employed, and simplicity of expression is desirable, the new formula is favored, namely,

$$\text{Vitamin}=K\ W^{5/3}$$

where the precise value of K is peculiar to the species."

A note on the precipitation of the antiscorbutic factor from lemon juice, S. S. Zilva (*Biochem. Jour., 21 (1927), No. 2, pp. 354, 355*).—Supplementing various attempts to isolate vitamin C (E. S. R., 55, p. 309), the author reports that the precipitation of the active material by basic lead acetate is

controlled by the H-ion concentration of the medium, the greater part of it being precipitated within a pH range of from 5.4 to 7.2. The fraction precipitated within this range contains a much smaller amount of total solids and sugar than the total precipitate at pH 7 and is thought to be a convenient material for further purification.

The vitamin content of Cortex Limonis B. P.—Preliminary note, S. G. WILLIMOTT and F. WOKES (*Pharm. Jour. and Pharm. [London], 4. ser., 61 (1925), No. 3224, pp. 184–188, figs. 2*).—This paper contains descriptions of the early uses of lemon juice and lemon peel in medicine, the geographical sources of lemons, the botanical and microscopic characters of lemon peel, and the principal chemical constituents of lemon oil, together with a brief review of earlier work on the vitamin content of the juice and peel of citrus fruits. Following this, an account is given of preliminary experiments on the vitamin content of lemon flavedo, Cortex Limonis of the British Pharmacopoeia, from which the conclusion is drawn that this material contains appreciable amounts of vitamins. As the basal diet used was free from both vitamins A and B, the study gives no indication as to the relative amounts of these two vitamins. From the presence of vitamins in the outer but not the inner peel, the authors advance the view that an important factor in the production of vitamins in citrus fruit is photosynethetic action in the outer pigment part of the peel.

The vitamin content of Cortex Limonis, B. P., S. G. WILLIMOTT and F. WOKES (In *Year-Book of Pharmacy and Transactions of the British Pharmaceutical Conference, Glasgow. London: Pharmaceutical Press, 1925, pp. 507–516, fig. 1*).—A slightly abridged report of the above.

Oxidising enzymes in the peel of citrus fruits, S. G. WILLIMOTT and F. WOKES (*Biochem. Jour., 20 (1926), No. 5, pp. 1008–1012, fig. 1*).—To throw more light on the foregoing theory that an important factor in the production of vitamins in citrus fruits is photosynthetic action in the outer pigments, the flavedo and albedo of ripe oranges (bitter and sweet) and grapefruit and of lemons in all stages of growth were tested for oxidizing enzymes. Peroxidase was the only oxidizing enzyme identified, and this appeared to be fairly uniformly distributed throughout the peel in the orange and lemon, but to occur in higher concentration in the flavedo than in the albedo in the grapefruit.

The liquid obtained from lemon tissues by pounding with an equal quantity of distilled water and straining the resulting extract through cotton wool was tested for pH colorimetrically and also electrometrically with the quinhydrone electrode. Similar determinations were made on the juice. The reaction of both peel and juice was acid at all stages of growth, the H-ion concentration increasing as the fruit matured for about four months and then remaining nearly constant at about pH 2.5 for the juice and slightly over 4 for the peel.

Isolation of anti-beriberi-vitamin, B. C. P. JANSEN and W. F. DONATH (*Meded. Dienst Volksgezondh. Nederland. Indië, 1927, No. 1, pp. 186–199, pls. 3*).—The authors, working in the same laboratory in which Eijkman carried on his pioneer studies on the antineuritic vitamin, have prepared from rice polishings a crystalline substance which they believe to be the hydrochloride of the antineuritic vitamin. The method, which has been noted briefly from a preliminary report (E. S. R., 56, p. 410), consists essentially in extraction of the rice polishings with water acidified with sulfuric acid to an H-ion concentration of pH 4.5, adsorption on acid clay (a kind of fuller's earth), extraction of the activated clay with barium hydroxide at pH 12 or 13, followed by sulfuric acid, fractionation of the acid extract with silver nitrate and barium hydroxide to pH 4.5, 6.5, and 8, followed by a second treatment of the combined silver fractions which concentrates the vitamin in the second fraction, decomposition

of the vitamin-containing fraction with hydrochloric acid, and reprecipitation with phosphotungstic acid and 5 per cent sulfuric acid, purification of the phosphotungstate by solution in acetone and water and reprecipitation with 5 per cent sulfuric acid, decomposition of the purified phosphotungstate with barium hydroxide, removal of the barium phosphotungstate and excess of sulfuric acid, and acidification of the filtrate with hydrochloric acid, precipitation with platinic chloride, decomposition of the platinum precipitate with hydrogen sulfide and fractional crystallization of the chloride by dissolving it in absolute alcohol, and adding a small amount of acetone, decanting the solution from the small amount of deposit which forms on the side of the flask, and repeating the acetone treatment. Another method of treating the decomposed platinum salt was by precipitation with picrolinic acid and treatment of the picrolonate with ether or ethyl acetate and hydrochloric acid. By either method there is finally obtained from 300 kg. of rice polishings about 100 mg. of a crystalline substance which after recrystallization has a melting point of 250° C. corrected. As judged by protective experiments on small rice birds known as "bondols" and on pigeons, the crystalline substance has exceedingly powerful antineuritic action but no growth-promoting property. From 1 to 2 parts of the material to 1,000,000 parts of rice furnish complete protection. In commenting on this, attention is called to the fact that the dosage is on the same scale as that of thyroxin, adrenalin, etc.

The vitamin hydrochloride before final purification crystallises into bundles of needles and after purification in small bars joined into rosettes. It is not hygroscopic but dissolves readily in water. It is also readily soluble in methyl alcohol and less readily in ethyl alcohol. A 2 per cent aqueous solution gives a scanty precipitate with mercuric chloride, increasing with the addition of sodium acetate, a heavy precipitate with mercury sulfate in diluted sulfuric acid, a fine black precipitate with iodine-potassium iodide, a thick red precipitate with a solution of bismuth iodide in potassium iodide, and opacity with picric acid. No precipitate is formed with zinc chloride, cadmium chloride, lead acetate, cupric acetate, potassium chromate, potassium thiocyanide, and perchloric acid. With picrolonic acid and with gold chloride needle-shaped crystals are formed. Pauly's diazo reaction is given with sulfanilic acid and nitrous acid, followed by sodium hydroxide. Elementary analyses of the hydrochloride and gold chloride gave results conforming closely to the empirical formulas $C_6H_{10}ON_2.HCl$ and $C_6H_{10}ON_2.HCl.AuCl_3$. From this formula and the previous findings of other investigators indicating that the antineuritic vitamin does not react with nitrous acid and consequently contains neither primary nor secondary amino groups, it is considered probable that the vitamin contains either an imidazol or pyrimidine ring.

On the isolation of the anti-beri-beri vitamin, B. C. P. JANSEN and W. F. DONATH (*K. Akad. Wetensch. Amsterdam, Proc., 29 (1926), No. 10, pp. 1390–1400, pl. 1*).—Essentially noted above.

Rickets in rats, I, II, S. KARELITZ and A. T. SHOHL (*Jour. Biol. Chem., 73 (1927), No. 2, pp. 655–677, figs. 2*).—Two papers are presented.

I. *Metabolism studies on high calcium-low phosphorus diets* (pp. 655–664).—In this investigation of the calcium and phosphorus metabolism of rats from normal through the development of rickets, young rats from families raised on the Sherman stock diet B were placed at weaning on high calcium-low phosphorus rachitic diets and after 5 weeks were killed for blood serum and bone analyses and histological examination of the bones. Others on the same diet were kept in metabolism cages for collection of feces and urine and were killed at weekly intervals for the same analyses.

A comparison of the calcium and phosphorus metabolism data with the data reported by Boas (E. S. R., 51, p. 896; 55, p. 892) showed a number of similarities in the metabolism of rickets although the diets were not the same. In both the calcium and phosphorus balances were positive though below normal. The calcium balances in the present study were similar to those reported by Boas, but the phosphorus balances were lower, probably owing to the lower phosphorus content of the diet. The calcium retention was 50 per cent and the phosphorus retention about 20 per cent of the normal. The percentages excreted in the feces and urine were different from those reported by Boas, but similar to those reported by Orr et al. in their study of high calcium-low phosphorus diets in rachitic children (E. S. R., 52, p. 763).

The blood serum analyses were typical of rickets produced on this diet—normal or slightly elevated calcium and low phosphorus. The histological evidence confirmed the existence of uniform and severe rickets. Bone analyses showed that during the development of rickets calcium deposition had not ceased, but was proceeding at only one-third the normal rate.

II. *The effect of phosphate added to the diet of rachitic rats* (pp. 665–677).—In this extension of the previous study, young rats were kept on the rachitic diet for 21 days and then enough sodium hydrogen phosphate (NaH_2PO_4) was added to their diet to bring the Ca : P ratio to approximately 1 instead of 4.25 in the previous study. The feeding was continued for 2 weeks.

This change in the diet was followed by a rapid change in the blood serum. On the third day the phosphorus rose to from 14.5 to 16 mg. per 100 cc. and the calcium fell to from 5.5 to 7 mg. The values gradually changed toward normal, reaching normal values in about 2 weeks. This abrupt change in serum concentration was accompanied by a rapid deposition of calcium in the bones, although the values did not reach normal.

The retention of calcium decreased and that of phosphorus increased both absolutely and relatively. During the first week the ratio of retention of Ca : P was 1.7 and the second week 0.8 as compared with 1.58 for normal and 3.9 for rachitic rats. This more nearly normal ratio is considered to indicate that the metabolism on the high phosphorus diet was that of healing rickets. Several of the rats, however, showed symptoms approaching tetany.

The antirachitic and calcifying properties of summer- and winter-produced dry milk, irradiated and non-irradiated, G. C. SUPPLEE and O. D. DOW (*Jour. Biol. Chem.*, 73 (1927), No. 2, pp. 617–622).—Samples of summer-produced and winter-produced dry milk (Dryco) made by the Just double-cylinder process were tested for antirachitic and calcifying properties before and after irradiation under identical conditions.

The feeding of graded amounts between 1 and 15 cc. of the nonirradiated summer-produced milk brought about a progressive increase in the ash content of the humeri of rats on the Sherman-Pappenheimer ration No. 84. Similar amounts of nonirradiated winter-produced milk also increased the ash content of the bones, but to an extent from 2 to 5 per cent lower than that resulting from the summer milk. The same quantities of irradiated summer-produced milk gave results from 2 to 5 per cent higher than the same milk nonirradiated up to a 9 cc. level, but less than 1 per cent difference at the 15 per cent level. Irradiated winter-produced milk gave results from 4.5 to 6 per cent higher than the nonirradiated winter milk even at the 15 per cent level. The irradiated winter milk at all the levels fed gave higher results than the nonirradiated summer milk at corresponding levels and substantially the same results as the irradiated summer milk at the higher levels.

"The results indicate that both winter- and summer-produced milk may have the same potential capacity for endowment with antirachitic and calcifying

properties by ultra-violet light. The realization of this potential capacity is not attained in milk produced eiher in the summer or winter months. However, when the cows are subjected to the greater degree of solar irradiation prevailing in the summer months the embodiment of antirachitic and calcifying properties in the milk is greater than in the winter months when the animals are exposed to the activating rays to a much less degree. Because of the inherent conditions in the quality of the food consumed by cows in the temperate zones during the winter and summer months, the effect of such conditions on the antirachitic properties of the milk is not precluded by the data recorded herein."

The parent substance of vitamin D, O. ROSENHEIM and T. A. WEBSTER (*Biochem. Jour., 21 (1927), No. 2, pp. 389–397, pl. 1*).—This is a detailed report of the investigations noted from a preliminary report by the authors (E. S. R., 57, p. 393) and one by Windaus (E. S. R., 57, p. 197), which have led to the conclusion that the precursor of vitamin D is ergosterol or a highly unsaturated sterol of similar constitution which is converted into vitamin D by irradiation. The experimental work reported included the removal of the precursor or provitamin from various sterols, the precipitation of provitamin by digitonin, and the spectroscopic and biological evidence that ergosterol is the provitamin. Methods which can be used for the removal of the provitamin from sterols include the bromination method previously described, the action of thionyl chloride or phosphorus pentachloride, charcoal, and potassium permanganate in acetone solution. In connection with the use of charcoal attention is called to the limitations in the use of irradiated cholesterol as a source of vitamin D in vitamin A experiments, for if the cholesterol has been purified previously with charcoal it can not be rendered antirachitic by irradiation. Irradiated ergosterol is recommended as a more reliable source of viamin D.

As judged by spectroscopic examination, the amount of ergosterol present in ordinary cholesterol is of the order 1:2,000. The limiting dose of irradiated ergosterol for the protection of rats has not yet been determined, but daily doses of 0.0001 mg. have proved completely protective and it is thought that the limiting dose will be less han 0.00002 mg. "Irradiated ergosterol is therefore the most potent antirachitic substance known, 5 mg. being equivalent to approximately 1 liter of a good cod-liver oil. It is of interest to note that a dose 10,000 times greater than what is at present regarded as an effective dose produced no obvious ill effects on rats under the experimental conditions used."

A search for vitamin D in the diatom Nitzschia closterium (W. Sm.), J. L. LEIGH-CLARE (*Biochem. Jour., 21 (1927), No. 2, pp. 368–372*).—As part of an attempt to trace the synthesis of vitamin D in cod-liver oil, the marine diatom *N. closterium* grown as described by Jameson, Drummond, and Coward in the report of a similar study of the synthesis of vitamin A (E. S. R., 47, p. 769) under conditions comparable to those to which it is exposed when floating in the sea was used as the sole source of vitamin D in feeding experiments with young rats, using the method of Chick, Korenchevsky, and Roscoe (E. S. R., 56, p. 89).

Contrary to the results previously reported for vitamin A, the diatom contained no appreciable amounts of vitamin D, thus ruling out unicellular marine organisms as the ultimate source of this vitamin in cod-liver oil.

On the absorption of vitamin D from the skin, E. M. HUME, N. S. LUCAS, and H. H. SMITH (*Biochem. Jour., 21 (1927), No. 2, pp. 362–367*).—The authors have demonstrated that rickets can be prevented in rats and rabbits by the repeated application of irradiated cholesterol to a small area of depilated skin. The treatment was given three times a week for three weeks to the rats and at the same intervals for five or eight weeks to the rabbits. Rickets was prevented and nearly normal calcification of the bones produced in rabbits by

irradiating an area of the skin 2.5 by 3.5 cm. for 10 minutes at the stated times. These results are thought to support the suggestion of Hess, Weinstock, and Helman (E. S. R., 54, p. 568) that the protection against rickets afforded by sunshine is due to the activation of lanolin and its subsequent absorption through the skin.

An experiment in the application of diabetic dietetics, M. F. DeLorme (*Jour. Amer. Med. Assoc., 89 (1927), No. 1, pp. 17–19, figs. 4*).—In this experiment, which has been tried for a year with marked success, diabetic patients acquire the necessary knowledge of dietary adjustments to their particular condition and are instructed in the examination of the urine for sugar and the administration of insulin, not through hospitalization but through attendance at a so-called diabetic dining room conducted by a clinician, with the assistance of a dietitian specially trained in diabetic dietetics. The plan is described in considerable detail, with reproductions of specimen records.

TEXTILES AND CLOTHING

Sledded and snapped cotton, R. W. Philip (*Cotton, 91 (1927), No. 9, pp. 867–870, figs. 9*).—The relative merits of cotton harvested by snapping and sledding, practices current in certain sections of Texas and Oklahoma, are discussed from the viewpoint of the cotton mill.

The effect of watering on cotton (*Textile Recorder, 45 (1927), No. 532, pp. 39, 44*).—Investigations of Meadows and Blair (E. S. R., 49, p. 331), Denham (E. S. R., 49, p. 646), and Burns (E. S. R., 54, p. 234) and commercial experience are held to show that wetting of cotton lint before or during baling is definitely prejudicial to its storage and spinning qualities. Microscopic study of the fiber indicates that even slight damping is harmful and should be avoided.

Study of cotton softeners, F. A. Hayes (*Textile World, 71 (1927), No. 22, pp. 43, 45, 47, figs. 4*).—The series of practical experiments and laboratory studies described were concerned with the use of cotton softeners, i. e., compounds capable of imparting to cotton softness to touch after dyeing or bleaching, the development of the theory and principles of the use of softening agents, and the determination of the most economical softener for mill use.

A résumé of recent research work in flax in United States and Great Britain (*Textile World, 71 (1927), No. 25, pp. 25, 26*).—Investigations concerned with breeding, retting, spinning, weaving, bleaching, and cottonizing, and with fiber characteristics are reviewed briefly.

Handmade rugs, E. S. Bowles (*Boston: Little, Brown & Co., 1927, pp. XV+205, pls. 4, figs. 83*).—A series of papers, most of which appeared originally in various periodicals, on handmade rugs, particularly hooked rugs. Of particular interest is a collection of old-time dye recipes. The volume is abundantly illustrated with photographs, some in color, of authentic old-time rugs.

HOME MANAGEMENT AND EQUIPMENT

The home-maker and her job, L. M. Gilbreth (*New York and London: D. Appleton & Co., 1927, pp. [XI]+155, pls. 2*).—"This book applies to the home the methods of eliminating waste that have been successful in industry. To the home-maker it offers a philosophy that will make her work satisfying, a technique that will make it easy, and a method of approach that will make it interesting."

[Home management and equipment investigations at the Rhode Island Station, 1926] (*Rhode Island Sta. Rpt. 1926, pp. 45*).—Pedometer measurements showed that students at the home management house walked one mile per hour during the operations connected with homemaking. The preparation

and serving of simple meals required 4.5 hours and 2.8 miles of walking per day. More elaborate meals required 8.8 hours and 6.8 miles.

Answers from 191 farm bureau women to a questionnaire as to electrical equipment showed that 177 owned flatirons, 127 vacuum cleaners, 108 toasters, 72 washing machines, and 37 sewing machines. In all, 717 pieces of 16 different kinds were enumerated.

MISCELLANEOUS

Solving farm problems by research: One year's work [at the Missouri Station], July 1, 1925, to June 30, 1926, F. B. Mumford, S. B. Shirky, et al. (*Missouri Sta. Bul. 244 (1926), pp. 62, figs. 13*).—This contains the organization list, a report on the work and publications of the station, and a financial statement for the Federal funds for the year ended June 30, 1926. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Report of the Porto Rico Agricultural Experiment Station, 1925, D. W. May et al. (*Porto Rico. Sta. Rpt. 1925, pp. [2]+40, figs. 13*).—This contains the organization list, a report of the director as to the general conditions and lines of work conducted at the station during the year, and reports of the assistant chemist, agriculturist, horticulturist, plant breeder, parasitologist, and plant pathologist. The experimental work is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report of [Rhode Island Station, 1926], B. L. Hartwell (*Rhode Island Sta. Rpt. 1926, pp. 34–47*).—This report includes experimental work and meteorological data, for the most part abstracted elsewhere in this issue.

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [May–June, 1927] (*Ohio Sta. Bimo. Bul., 12 (1927), No. 3, pp. 65–104, figs. 14*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: January Hatched Pullets, by D. C. Kennard, and People on Ohio Farms, Comparative Prices of Ohio Farm Products, and Index Numbers of Production, Wages, and Prices, all by J. I. Falconer.

NOTES

California University and Station.—W. P. Tufts, assistant professor of pomology and associate pomologist, and F. J. Veihmeyer, assistant professor of irrigation investigations and practice and associate engineer, have been granted the degrees of doctor of philosophy, the former from the University of Wisconsin and the latter from Johns Hopkins University. H. O. Matson has been appointed assistant in agricultural engineering and G. H. Brockmeyer, assistant in dairy industry.

Connecticut Storrs College and Station.—The first New England School of Marketing and Institute of Cooperation was held at the college August 16–19 under the auspices of the college, cooperative associations of the State, and the division of cooperative marketing of the U. S. D. A. Bureau of Agricultural Economics. There was a registration of about 150 students, made up of farmers, officials of State marketing bureaus, agricultural colleges and vocational schools, county agents, employees of cooperative associations, and others. Special attention was given to problems of the marketing of milk, fruits and vegetables, poultry, and tobacco. The school was regarded as very successful, and it is planned to continue it each year in some one of the New England States. The next school is projected for 1928 at the Massachusetts College.

Miss Elizabeth V. W. Clapp, previously connected with the Institute of Social and Religious Research, has been given charge of a Purnell project in the station dealing with standards of living in farm homes.

Delaware University and Station.—George L. Schuster, professor of agronomy and agronomist, has been granted leave of absence for nine months to take up graduate work at Cornell University. Claude E. Phillips and O. A. Pope have been appointed assistant agronomists in the station, the former vice J. M. Graham, resigned to engage in commercial work. M. M. Dougherty has been appointed assistant economist in the station, beginning September 15.

Idaho University and Station.—The six vacation camps for farm women were attended this year by approximately 1,200 persons. At the annual 4-H club week at the university, held June 12 to 18, the registration was 256 boys and girls, an increase of 25 per cent over the previous year.

H. A. Bendixen, associate professor of dairy manufactures and assistant dairy husbandman, and Hobart Beresford, assistant professor of agricultural engineering and assistant agricultural engineer, have resigned, the former to accept a similar position September 1 at the Washington College and the latter to engage in commercial work. F. E. Whitehead has been granted a year's leave of absence as associate professor of entomology and extension entomologist for graduate study at the Iowa College, during which time W. E. Schull will serve as assistant professor of entomology and extension entomologist. Other appointments include Dr. Ella Woods to the newly established research professorship of home economics, R. H. Engle as economist in the station, George S. Schilling as assistant bacteriologist, Frank E. Moore as assistant poultry husbandman beginning July 1, and Arthur M. Sowder as extension forester.

Maryland University and Station.—Dr. A. G. McCall, head of the department of soils and geology and in charge of soil investigations, has accepted an appointment in charge of the division of soils in the new Bureau of Chemistry and Soils of the U. S. Department of Agriculture and has entered upon his duties.

Michigan College.—An act removing the limitation placed on the mill tax for the support of the college by the State has been signed by the governor. It is estimated that this will result in an increase in income for the coming year of $541,958.

The State Association for the Advancement of Agricultural Teaching has presented the college with a bronze plaque commemorating the work of the late Walter H. French, head of the work in agricultural education for many years. This plaque, to be known as the Walter H. French Memorial, contains a likeness of Professor French, with a background portraying agricultural pursuits, particularly the gathering of a rich harvest.

Dr. John Rufi has been made head of the department of education vice John Phelan, who is largely occupied with administrative work.

Minnesota University and Station.—With a view to acquainting the farmers of the State with a number of the new varieties of cereals developed by the station in its plant breeding work, a field day was held at University Farm on July 12 in cooperation with the Minnesota Crop Improvement Association. About 500 farmers devoted the day to an inspection of the plats and consultation with the crop and plant breeding specialists. On the following day a similar opportunity was given the seedsmen of the State, and later visiting days were held at the various substations. The attendance in each case was large and appreciative, and it is estimated that approximately 2,000 farmers in this way gained a comprehensive view of the crop improvement work of the station. Particular interest was manifested in Marquillo wheat, a hybrid resistant to black stem rust, which is expected to be ready for introduction in the spring of 1929.

L. F. Garey, assistant professor of farm management research and assistant agriculturist in the station, has been granted sabbatical leave for a year of graduate work at Cornell University in farm management and agricultural economics.

Nevada Station.—Recent experiments and field observations by the department of range management have shown that heavy losses of sheep in range flocks in eastern and central Nevada have been due to poisoning by the common chokecherry, *Prunus demissa*. In some instances several hundred animals have been lost from a single band. The losses are indirectly due to drought and to the depletion of range forage by overgrazing. Under these conditions sheep often eat excessive amounts of chokecherry with fatal results.

With the beginning of the current fiscal year the station has undertaken detailed studies of the cost of production of beef cattle on ranch and range in cooperation with the California Cattlemen's Association and the Nevada Livestock Association. These two commercial organizations are making available to the station records and data covering a period of several years, together with all current records of production costs, marketing data, and the like.

Cornell University and Station.—Louis Agassiz Fuertes, lecturer in ornithology since 1922 and well known as a naturalist, lecturer, and especially as an illustrator of birds, was killed in an automobile accident August 22. He was born in Ithaca February 7, 1874, and was a graduate of the university. He had been making paintings of birds since 1896, and many of these were used in Farmers' Bulletin 513 of the U. S. Department of Agriculture, entitled Fifty Common Birds of Farm and Orchard, and in various works on natural history.

J. G. Needham, head of the department of entomology, has been granted sabbatical leave for the coming year and has sailed for China, where he is to give a series of lectures on biological subjects at the Peking National University and Tsing Hua College and an address at the opening of new buildings at the University of Yen Ching.

Arno H. Nehrling, professor of floriculture, has resigned to engage in commercial work in Indiana. Richard B. Farnham, Charles J. Hudson, and E. I. Wilde have been added to the instruction staff of the department.

Other appointments include Robert W. Nafe of Clark University as assistant professor of rural social organization, effective September 1, when he will begin research problems in rural leadership and group conflict, and Dr. Clive McCay, a National Research fellow at Yale University Medical School, as assistant professor in animal husbandry to engage in research on the physiology of animal nutrition.

North Dakota College and Station.—H. M. Scott has been appointed instructor and research assistant in poultry husbandry, dividing his time equally between the college and station.

Pennsylvania College.—The first Institute of Chemistry was held at the college July 4 to 30 under the auspices of the American Chemical Society. The institute program consisted largely of conferences comparable to those of the well-known Institute of Politics at Williams College. These conferences covered the whole field of chemistry, with a day devoted to each topic. While no special effort was made to select subjects of direct application to agricultural science, several were of interest to this group of workers, among them the discussion of oxidation-reduction in the living cell, the general status and problems of nutrition, vitamins, and biochemistry. Others, such as the training of research chemists, were of broad appeal. The institute as a whole was regarded as very successful, and it is understood that its repetition at some institution in 1928 is contemplated.

Utah College and Station.—Dr. Maurice B. Linford is conducting a plant disease survey under a cooperative agreement with the U. S. D. A. Bureau of Plant Industry. It is expected that the survey will be completed about November 1.

Francis M. Coe, instructor in horticulture in the University of Nebraska and assistant horticulturist in the Nebraska Station, has been appointed assistant professor of horticulture and assistant horticulturist in the station, succeeding T. H. Abell, whose resignation has been previously noted.

Vermont University.—Dr. Guy Potter Benton, president from 1911 to 1919, died June 29 at the age of 62 years. During the World War he was actively associated with the work of the Y. M. C. A., and at its close served as a member of the U. S. Army Educational Corps and chief educational director of the American Army of Occupation with headquarters at Coblenz, receiving the Distinguished Service Medal for his services in this capacity. In 1921 he was appointed president of the University of the Philippines, retiring in 1924.

Virginia College and Station.—E. L. Langsford, assistant agricultural economist, and C. H. Kauffman, assistant in rural sociology, resigned July 1. C. L. Pickard, assistant rural sociologist, was transferred to extension work on the same date.

Recent appointments include R. A. Ballinger, assistant agricultural economist, effective July 15; C. H. Hamilton, assistant rural sociologist, effective July 1; E. F. Davis, assistant plant physiologist, effective August 15; and Dr. N. A. Pettinger as agronomist vice Dr. T. K. Wolfe, resigned effective September 1 to become editor of *The Southern Planter*.

Washington College and Station.—A. F. Heck, assistant professor of soils and assistant in soils, has been granted an additional year's leave of absence at the University of Wisconsin. Roscoe E. Bell, teaching fellow in the department of soils, has been appointed instructor, effective September 1. Dr. L. E. Miles, extension plant pathologist at the Alabama Polytechnic Institute, has been appointed assistant professor of plant pathology in the college and assistant in plant pathology in the station vice B. F. Dana, whose resignation has been previously noted.

West Virginia University and Station.—Dr. Henry Granger Knight, dean of the college of agriculture and director of the station, has been appointed chief of the new Bureau of Chemistry and Soils of the U. S. Department of Agriculture, effective October 1.

Virginia Institute of Public Affairs.—This institute was held at the University of Virginia during the 2-week period beginning August 8. Much of this time was given to a discussion of farm problems, including a round table conference conducted by President J. L. Coulter of the North Dakota College. The U. S. Department of Agriculture cooperated with the institute, with Dr. A. F. Woods, Director of Scientific Work, as its representative. On August 17, Dr. Woods presented a paper entitled The Relation of Education and Research to the Rural Problem, in which he attributed the rural problem to economic causes. "Agriculture," as he pointed out, "is passing from the extensive low-cost phase to the intensive high-cost phase, as all other business and industry has to do. To conduct the business of farming under these conditions requires intelligence fortified by training and education. Industry and commerce have gone through this transformation, in part at least, and agriculture must follow if it is to maintain itself on this basis."

Herman Frasch Foundation for Chemical Research.—A recent decision of the New York Court of Appeals upholds a bequest by the late Mrs. Elizabeth Blee Frasch of $1,000,000 to establish the Herman Frasch Foundation for Chemical Research. Under the terms of her will, the income from this fund is to be paid to one or more incorporated institutions in the United States, to be selected by the U. S. Trust Company after consultation with the American Chemical Society, "upon condition that the said institution shall agree that the money so received shall be devoted to research in the field of agricultural chemistry with the object of attaining results which shall be of practical benefit to the agricultural development of the United States." The institution so selected will have the use of the funds for a period of five years, during which time the American Chemical Society is to examine its work and report whether in its opinion satisfactory progress has been made. In the event of an unfavorable report, another institution is to be selected for a five year period and the procedure repeated.

The bequest was contested on the ground that the income might be used for private research, thereby depriving the gift of the religious, educational, charitable, or benevolent purpose necessary to create a perpetual trust "for the benefit of indefinite and uncertain persons" under the New York law, which is based on a statute of Queen Elizabeth. The Court of Appeals held, however, that Mrs. Frasch undoubtedly intended to create a trust for purposes which would advance the public welfare, and that while the statute does not specifically authorize bequests for research, "research is the method used by modern universities and scientific foundations to increase the sum of human knowledge. Research conducted for such purpose and by such institutions is clearly 'educational' and 'benevolent' within the meaning of the statute. . . . Conceptions of public charity, benevolence, and education change with passing generations."

Mrs. Frasch was the widow of the late Herman Frasch, a well-known chemist and president of the Union Sulphur Company. The bequest has been in litigation since her death in 1924.

Lithuanian Agricultural Academy.—The first yearbook of this institution, covering the years 1924–25 and 1925–26 and recently issued, gives considerable data regarding its history and development. Originally established by the Russian Government in 1912 as a secondary agricultural school and provided with 1,060 acres of land and a building costing over half a million dollars, it was reorganized by the Lithuanian Government and after six years converted into an institution of advanced learning, the second in Lithuania.

The academy is located at Dotnuva and is receiving over $150,000 per annum from the Government for upkeep and development. During its first two years of collegiate existence its teaching staff has increased from 7 to 37 and the student body from 50 to 120. Its equipment includes 15 scientific laboratories, an experimental field, and a fruit and vegetable experimental garden. Courses are offered in chemistry and physics, botany, soil science, rural economics and politics, forestry, agronomy, forest taxation, forest exploitation, and zootechny, and instruction is also given in zoology, entomology, German and English, farm buildings and machinery, and other lines. Several scientific papers have been prepared by members of the staff, including two dealing with soil biology and one with forestry.

Meeting of the Cooperators in the Study of the Factors Affecting the Quality and Palatability of Meat.—At a meeting of the cooperators in this group, held in Washington, D. C., August 9–11, representatives from 11 States gave reports on the work which they had conducted during the past year and discussed plans for the coming year.

The reports of the different committees indicated that considerable progress has been made, particularly with reference to the development of standard methods for cooking the several classes of meat. An important phase of the work accomplished at the meeting dealt with the adoption of requirements for the project, in which it was decided to include only those investigations having as their primary object studies of the factors affecting the quality of the meat produced. The chart for grading cooked meat was revised and adopted as a permanent record of the product tested.

The meeting was concluded by a visit to the Animal Husbandry Experiment Farm of the U. S. Department of Agriculture at Beltsville, Md., where mechanical means of measuring toughness and progress in the histological studies were demonstrated.

Fifth International Botanical Congress.—Arrangements are being made to hold this congress at Cambridge, England, in August, 1930. Seven sections are to be organized, namely, morphology (including anatomy), paleobotany, plant geography and ecology, taxonomy and nomenclature, genetics and cytology, physiology, and mycology and plant pathology. A. C. Seward has been selected as chairman of the executive committee, with Dr. A. B. Rendle as treasurer and F. T. Brooks of the University of Cambridge and Dr. T. F. Chipp of the Royal Botanic Gardens at Kew as honorary secretaries.

Necrology.—Ray P. Teele, recognized as an authority on the economic phases of irrigation and similar problems, died at Myton, Utah, August 31. Mr. Teele was born in Minnesota October 22, 1868, was graduated from the University of Nebraska in 1897, and received the M. A. degree from the same institution in 1899. In the latter year he entered the service of the Office of Experiment Stations, U. S. Department of Agriculture, as an editorial assistant in its irrigation and drainage investigations, and was thereafter connected with the Department until his death aside from transfers to the Bureau of the Census in 1910–

1912 and 1919–1921 for work on irrigation statistics. Most of his service was with irrigation investigations, but of late years he had been in charge of land reclamation, sale, and settlement in the Division of Land Economics and Land Utilization of the Bureau of Agricultural Economics. At the time of his death he was on detail to the Department of the Interior for a field study of the economic aspects of the Indian irrigation projects. He was the author of Irrigation in the United States (1915), The Economics of Land Reclamation (1927), and of many reports and articles on irrigation, and for several months was in charge of the section of rural engineering of *Experiment Station Record* on the establishment of this section in 1905.

Charles Fuller Baker, professor of tropical agriculture in the University of the Philippines substantially since 1912 and since 1919 also dean of the college and director of its experiment station, died at Manila late in July. Dean Baker was born in Lansing, Mich., March 22, 1872, and was graduated from the Michigan State College in 1891. He had subsequently been associated with the Alabama Polytechnic Institute, the State Agricultural College of Colorado, Pomona College, the Central Agricultural Experiment Station of Cuba, and the Botanic Gardens of Para and Singapore, and had served as associate editor of a number of agricultural and scientific journals in the Philippines and elsewhere. He was greatly interested in the development of tropical agriculture and the promotion of botanical research, participating in a number of field experiments and surveys, and had long cooperated with the U. S. Department of Agriculture and other institutions. His chief work, however, was in the upbuilding of the Philippine College of Agriculture, from which he was to have retired with the title of dean and director emeritus on December 1.

New Journals.—The International Institute of Agriculture has recently established two new monthly periodicals. One of these is *International Review of Agriculture*, published in English with editions also in French, German, Italian, and Spanish. This is a combination of the two quarterlies previously issued by the institute, *International Review of the Science and Practice of Agriculture* (published in 5 languages) and *International Review of Agricultural Economics* (published in 4 languages). Portions of the new review are still to be issued as separates under the titles of the former quarterlies, and a double system of pagination is being used for that purpose.

The second new periodical of the institute is *International Bulletin of Plant Protection*. This will be published in English, French, German, Italian, and Spanish, and is intended to diffuse as widely and as rapidly as possible the information forwarded to the institute by its official correspondents on plant diseases and pests. The initial number contains a list of these correspondents. The material will be grouped under the headings of discoveries and current events in world phytopathology, questions relating to plant protection in the various countries, legislative and administrative measures for plant protection, recent bibliographies relating to plant diseases and pests, and notes of current happenings.

The Economic History Review is being published annually in London as the organ of the Economic History Society. The initial number contains an article of considerable agricultural interest, The Small Landowner, 1780–1832, in the Light of the Land Tax Assessments, by E. Davies.

EXPERIMENT STATION RECORD

VOL. 57 OCTOBER ABSTRACT NUMBER No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

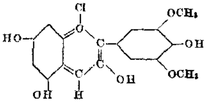
Colloids, H. R. KRUYT, trans. by H. S. VAN KLOOSTER (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, pp. XI+262, figs. 116*).—This textbook on colloid chemistry consists of a general introduction in which are included a preliminary consideration of colloidal systems, boundary phenomena, and capillary electrical phenomena; a section of eight chapters on suspensoids in which the stability of suspensoids, charge and stability, the constitution of the double layer, the kinetics of flocculation, the optical properties of suspensoids, the properties of suspensoids from the kinetic point of view, the formation of suspensoid sols, and the development of the theory of suspensoids are considered; a section of five chapters on emulsoids dealing with the general properties of emulsoids, with stability of emulsoids, protein sols, osmotic phenomena, and gels; and a final chapter on special sols, including soaps, emulsions, and the special sols met with in photo-colloid chemistry.

The present status of colloid chemistry, P. BARY (*Où en Est la Chimie Colloïdale. Paris: Gauthier-Villars & Co., 1927, pp. [3]+323, figs. 73*).—This is an introductory account, largely nonmathematical, of the development and present knowledge of the special chemistry of the colloids. The first chapter defines the more generally accepted terms, gives a brief historical outline, and characterizes colloids and their more important properties in a general way. Chapters 2 to 5 deal with swelling, gel formation, osmosis, ultrafiltration, etc.; disperse systems; colloidal solutions; and the general application of colloid chemistry. The remaining 7 chapters are devoted each to a group of related colloidal substances of industrial importance: Glass, ceramics, and cements; oils and resins; the hydrocarbons, mineral oils, and caoutchouc; cellulose and its derivatives; textile materials and their dyeing; protein substances; and miscellaneous commercially important colloids.

Chemical technology of the organic compounds, R. O. HERZOG (*Chemische Technologie der Organischen Verbindungen. Heidelberg: Carl Winter, 1927, 2. ed., rev., pp. XII+998, [pls. 2], figs. [467]*).—This is an exhaustive treatise on industrial organic chemistry. Part 1, concerned mainly with methods of obtaining and working up naturally occurring or crude substances into the raw materials of organic chemical industry, contains chapters on bitumens and tars; on fats, oils, and waxes; on resins and caoutchouc; on carbohydrates, including the nitrates and acetates of cellulose, etc.; on fermentation industries; and on the proteins, including tanning, glue and gelatin, and milk products. Part 2 deals with coal-tar colors, ethereal oils and perfumes, pharmaceutical products, explosives, and photographic preparations; and special preparations,

including formic, oxalic, tartaric, and citric acids, carbon bisulfide and tetrachloride, products from acetylene, the preparation and utilization of formaldehyde, etc. Part 3 is devoted to the chemical technology of the textile industries.

Anthocyans appearing in the pigment of Isabella grapes, R. J. ANDERSON and F. P. NABENHAUER (*New York State Sta. Tech. Bul. 123 (1926), pp. 13*).—The pigment of the skins of Isabella grapes was found to be a crystalline monoglucoside having the empirical formula $C_{23}H_{25}O_{12}Cl+4H_2O$. This compound appears to be identical with the anthocyanin, oenin, of the dark blue European grape, *Vitis vinifera*. The anthocyanidin chloride, $C_{17}H_{15}O_7Cl+1.5H_2O$, was prepared by hydrolyzing the glucoside, crystallized in prisms, and appeared identical with oenidin. In crosses between American and European grapes, the pigment of *V. vinifera* is inherited by the hybrid. Acetyl syringic acid was obtained on oxidizing the acetyl derivative of the anthocyanidin with neutral permanganate and by the hydrolysis of the acetylated oxidation product syringic acid was obtained. The constitution of oenidin chloride is, therefore, considered to be as follows:



Lubrication and lubricants: A treatise on the theory and practice of lubrication and on the nature, properties, and testing of lubricants, L. ARCHBUTT and R. M. DEELEY (*London: Charles Griffin & Co., 1927, 5. ed., rev. and enl., pp. XXXII+650, figs. 272*).—This is an exhaustive treatment of the subject.

Gottlob's technology of rubber, trans. and rev. by J. L. ROSENBAUM (*London: Maclaren & Sons, 1927, pp. XVI+350, figs. 117*).—This is a translation from the second (1925) German edition and contains an introduction (27 pages) on the chemistry of the pure natural rubber hydrocarbon; part 1 (about 200 pages), dealing with the general technology of rubber, and including a final chapter on synthetic rubber; and part 2 (about 100 pages) dealing with the special technology of the various types of hot and cold vulcanized rubber products. The book has an ample subject index and an author index.

Phosphoric acid, phosphates, and phosphatic fertilizers, W. H. WAGGAMAN and H. W. EASTERWOOD (*New York: Chem. Catalog Co., 1927, pp. 370, figs. 58*).—This monograph, published as No. 34 of the American Chemical Society series, deals with the phosphates and related products principally from an industrial standpoint. In an introductory chapter, however, the history of the chemistry of phosphorus and its compounds is briefly sketched, the chemistry of the oxides and oxyacids of phosphorus is reviewed, and the rôle of phosphoric acid in animal metabolism and in general agriculture and the sources of phosphoric acid and their classification are briefly considered. The remaining chapters cover the phosphates of the United States and the reserve supply of phosphate rock; the phosphate supplies of foreign countries, including those of the Pacific and the Indian Ocean islands, of Europe, and of Asia; the so-called available phosphates, with processes involved in their preparation; the water-soluble phosphates, principally acid or superphosphate, and related phosphatic fertilizer material; the manufacture of phosphoric acid by the sulfuric acid process; the volatilization process for producing phosphoric acid; the manufacture and characteristics of phosphatic baking acids and powders; the use of phosphates

in softening water; and miscellaneous uses of phosphoric acid and the phosphates, including rust proofing compounds, glass and ceramic products, beverages, dental cements, photography, fire-proofing compounds, sugar refining, fermentation processes, the weighting of silk, etc.

An appendix contains a classified list of patents concerned with the preparation or use of phosphoric acid and the phosphates.

Technical methods of analysis, edited by R. C. GRIFFIN (*New York and London: McGraw-Hill Book Co., 1927, 2. ed., pp. XVII+936, figs. 44*).—This book contains a representative selection of analytical methods which have been adopted as standard procedures in a large commercial laboratory engaged in technical analysis. Many of the methods of the first edition (E. S. R., 47, p. 108) have been expanded, and some 40 additional methods have been included. The chapter on foods has been considerably elaborated, and a new chapter on water, sewage, and soils has been added.

Standard methods of the Division of Laboratories and Research of the New York State Department of Health, A. B. WADSWORTH (*Baltimore: Williams & Wilkins Co., 1927, pp. XX+704, pls. 12, figs. 66*).—This is a complete and detailed statement of the general laboratory procedures and special methods used in the bacteriological work of the Division of Laboratories and Research of the New York State Department of Health.

A handbook of organic analysis, H. T. CLARKE (*London: Edward Arnold & Co., 1926, 4. ed., pp. XII+363, figs. 23*).—This is essentially similar to editions previously noted (E. S. R., 37, p. 614), save that "the normal progress of organic chemistry has disclosed a variety of new reactions and compounds; so that it has been considered advisable to subject the portion of the text dealing with the qualitative aspect of organic analysis to a thorough revision."

Some sources of error in the colorimetric determination of pH values, J. W. SCHLEGEL and A. H. STUEBER (*Indus. and Engin. Chem., 19 (1927), No. 5, pp. 631–633*).—"Various sources of error are found in the colorimetric determination of pH values of sugarhouse products, chiefly due to faulty manipulative details and to the method of preparation of the indicator dye." Among these sources of error were variations in the diameter of the comparison tubes or errors in their graduation, excessive dilution of but slightly buffered samples, oven drying of tubes resulting in high figures due either to solution of glass by the rinse water or to deposits of traces of other salts from the water, acid from finger or thumb used to close the comparison tubes in mixing sample and dye, improperly prepared dye solutions, and the use of buffer solutions kept in contact with paraffin bottle linings, ordinary paraffin showing a decided acid reaction. Bromothymol blue should be prepared with the addition of just sufficient sodium hydroxide to bring the solution to pH7 and should be kept in bottles of Pyrex or other resistant glass, rather than in wax-lined bottles.

Standard iodine solution, F. C. BOND (*Indus. and Engin. Chem., 19 (1927), No. 5, p. 607*).—A N/20 iodine solution requiring no standardization when freshly prepared may be obtained as follows:

"Dissolve 40 gm. of potassium iodide (weighed roughly) in a liter of water and add 25 cc. of glacial acetic acid. This should be considered as a stock solution and should preferably be kept in a colored bottle. Put about 100 cc. of this solution into a 250-cc. graduated flask and run in 125 cc. of N/10 potassium permanganate from a burette. Dilute the solution to 250 cc. with distilled water, and use as N/20 iodine solution. If the potassium permanganate is not exactly tenth normal, its normality factor divided by two will be the normality factor of the iodine solution, since the volume of the iodine solution is double that of the potassium permanganate solution added."

Determination of methanol in the presence of ethyl alcohol, F. S. Mortimer (*Indus. and Engin. Chem., 19 (1927), No. 5, pp. 635, 636, fig. 1*).—The assumption that the addition of methyl alcohol to ethyl alcohol decreases the refractive index in direct proportion to the amount of methanol present is nearly but not absolutely correct. Refractive index values were found more consistent for mixtures containing 40 per cent or less of total alcohols than for mixtures of higher alcoholic content. Tables of refractivities and of refractometer scale readings against weight percentage of total alcohols are given, together with a triangular diagram for the graphic determination of methyl alcohol, ethyl alcohol, and water in ternary mixtures. More accurate determinations were obtained by locating data on this triangular diagram than by the original method of Leach and Lythgoe,[1] of which the graphic method is a modification.

Introduction to quantitative agricultural analysis, G. Wiegner (*Anleitung zum Quantitativen Agrikulturchemischen Praktikum. Berlin: Borntraeger Bros., 1926, pp. XVI+348, figs. 33*).—This book is divided into four sections, the first of which presents an elementary course in quantitative analysis. The second and following sections introduce the analysis of fertilizer compounds and their mixtures, furnish directions for the physical and chemical analysis of soils, and deal with the chemical examination of feeding stuffs. There are five appendixes, the first dealing with the examination of milk and milk products, the second with the investigation of wines, etc., and the third with the sediment method of Wiegner and Gessner, while the fourth and fifth contain atomic weights and logarithmic tables.

Chemical analysis of soils, K. K. Gedroiz, trans. by L. Frey (*Chemische Bodenanalyse. Berlin: Borntraeger Bros., 1926 pp. XII+245, figs. 8*).—This is a handbook for the chemical laboratory examination of soils. In the introduction to this German edition, translated from the Russian, attention is directed to the complex and labile nature of the composition of soils and to the often marked alterations in the physical properties and productivity of soils brought about by changes in chemical composition so slight as to be difficult of determination. This question, the author says, and the possibility of its solution in the practice of laboratory investigation has been entered upon so far as was found practicable in the present volume.

The subject is considered under the following chapter headings: The preparation of soils for analysis; the gross analysis of soils, so defined as to include all those analyses not specifically directed to the determination of substances or conditions characteristic solely of soils; the determination of lithium, rubidium, caesium, titanium, zirconium, and vanadium in soils; the hydrochloric acid extract; the investigation of the absorbent soil complexes (the zeolite and humus fractions of the soil); the water extracts of soils; methods for colorimetric analyses; the investigation of the soil solution; the investigation of the lime requirement of soils; and the preparation of the more important reagents.

Analysis of hydrated lime by a thermochemical method, D. F. Richardson (*Indus. and Engin. Chem., 19 (1927), No. 5, pp. 625–629, figs. 4*).—A method, based upon the difference between the thermal dissociation of calcium and of magnesium hydroxides, is described, and its theory is discussed.

Foods and condiments and their examination, A. Jolles (*Die Nahrungs- und Genussmittel und ihre Beurteilung. Leipzig and Vienna: Franz Deuticke, 1926, 2. ed., rev. and enl., pp. XV+463, pl. 1, figs. 89*).—This is essentially

[1] Jour. Amer. Chem. Soc., 27 (1905), No. 8, pp. 964–972.

similar in general plan to the edition of 1909 (E. S. R., 22, p. 163), but has been thoroughly revised and somewhat enlarged.

The presence of formaldehyde in wood smoke and in smoked foodstuffs, E. H. Callow (*Analyst, 52 (1927), No. 616, pp. 391–395*).—Smoked bacon and ham gave a strong reaction for formaldehyde when tested by Schryver's method (E. S. R., 22, p. 166), in which the solution to be tested is added to a phenylhydrazine hydrochloride solution to which is further added hydrochloric acid and potassium ferricyanide solution. Quantitative determinations were made by comparison with a series of standard colors prepared from known quantities of formaldehyde.

The specificity of the reaction was tested with a number of substances, with the result that acetic acid, acetone, acetophenone, allyl alcohol, dimethyl acetal, formic acid, methyl alcohol, methyl acetate, methylamine hydrochloride, pyridine, sodium nitrate, and sodium nitrite in a concentration of 1 part in 10,000, were found to give completely negative tests. Acetaldehyde, furfuraldehyde, and sodium nitrite in 1 part in 1,000 solution, gave brownish to greenish colors quite different in appearance and behavior from the magenta shade given by formaldehyde. Acrolein diluted to 1 part in 1,000 gave a color equal to that produced by 1 part in 1,000,000 of formaldehyde in 5 minutes and equalled the color produced by 3 parts of formaldehyde in 1,000,000 after standing for an hour. Wood smoke distillates and water through which the uncondensed portion of the smoke had been bubbled gave very strongly positive reactions. The di-β-naphthol derivative of formaldehyde melting at 190° C. was prepared from the formaldehyde contained in the distillate condensed from wood smoke and was isolated and identified with a preparation made from pure formaldehyde. Estimates of the formaldehyde content of commercial smoked herring, bloater, kipper, ham, and bacon gave figures ranging from 0.5 to 1,000 parts per million of formaldehyde.

Oil content of flaxseed, with comparisons of tests for determining oil content, D. A. Coleman and H. C. Fellows (*U. S. Dept. Agr. Bul. 1471 (1927), pp. 35, fig. 1*).—Large differences have been found in the oil content of various classes of flaxseed, and within a given class this variation may amount in some years to as much as 15 per cent. No close relationship was found between the test weight per bushel and the oil content of flaxseed; and the percentage of damaged seed was found an expression of the quality of the oil rather than of the quantity present. It is stated that as no close relationship exists between the physical factors now influencing the commercial grade flaxseed and the oil content of the seed, there can be no close relationship between present commercial grades and oil content, for which reason careful chemical analysis bcomes necessary. For the determination of the oil the following optical method is recommended:

"Grind 25 gm. of the flaxseed sample so that at least 80 per cent of the meal will pass through a 34-grits gauze sieve. Weigh out 2 gm. of the ground sample and empty it into a 3-in. porcelain mortar, which has been previously heated to 70° C., and grind the flaxseed meal with 4 cc. of halowax oil, grade No. 1007, for at least 2 minutes. Filter through a small folded filter, using a 40-mm. glass funnel seated on a flat-bottomed test tube. Let the tube and contents cool to room temperature. Place a drop of this mixture on the prism of the refractometer and take the average of three readings. *Note the temperature, and for every degree above 25° add 0.00045 to the refractometer reading and for every degree below 25° subtract this amount.*"

The calculation of the results obtained by this method requires the use of a table given in the bulletin.

Cane table syrup making, J. J. Munson (*Louisiana Stas. Rpt. 1926, pp. 82–88*).—This is a preliminary general report on the effect upon clarification processes of the depth of boiling on finishing in open pans as against boiling to semisirup in an open pan with a final concentration under diminished pressure.

METEOROLOGY

Monthly weather review [March–April, 1927] (*U. S. Mo. Weather Rev., 55 (1927), Nos. 3, pp. 107–153, pls. 11, figs. 17; 4, pp. 155–210, pls. 11, figs. 5*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for March and April, 1927, and bibliographical information, notes, and abstracts, these numbers contain the following contributions:

No. 3.—Interpretation of Correlation Coefficients, by C. F. Marvin; On the Interpretation of Correlation Coefficients in the Analysis of Causal Relations in Physical Phenomena, by E. W. Woolard; A Study of the Possibility of Economic Value in Statistical Investigations of Rainfall Periodicities, by D. Alter (see below); The Thunderstorm at Cincinnati and Its Relation to Electrical Power Service (illus.), by W. C. Devereaux; Can Thunderstorms be Classified? by A. J. Henry; Weather and Forest Inflammability in the Southern Appalachians (illus.), by E. F. McCarthy (see below); Lightning Storms and Forest Fires in the State of Washington (illus.), by G. W. Alexander (see p. 507); March Temperature and the Following Season's Precipitation in Coastal Southern California (illus.), by G. M. French (see below); and Formulae for the Vapour Pressure of Ice and of Water Below 0° C., by F. J. W. Whipple.

No. 4.—Measurements of Solar Radiation Intensity and Determinations of Its Depletion by the Atmosphere, with Bibliography of Pyrheliometric Measurements (illus.), by H. H. Kimball; Tornadoes in Virginia, 1814–1925 (illus.), by A. W. Giles; The Illinois Tornado of April 19, 1927, by C. J. Root; Tornadoes in Arkansas, 1879–1926 (illus.), by H. S. Cole; The Rocksprings, Texas, Tornado, April 12, 1927, by J. H. Jarboe; Observing a Tornado's Life, by T. G. Shipman; and Variable Features of Barometric Depressions and Anticyclones as a Basis for Seasonal Forecasting, by N. A. Hessling.

A study of the possibility of economic value in statistical investigations of rainfall periodicities, D. Alter (*U. S. Mo. Weather Rev., 55 (1927), No. 3, pp. 110–112*).—The author shows in this article that "a period approximately 43 years, with harmonics, exists in the rainfall data of the British Isles. It may be complex, it may be constant, and it may be variable; time alone can tell which of these is true. Whether predictions made by it at present, or even at some future time, can have economic value is uncertain."

March temperature and the following season's precipitation in coastal southern California, G. M. French (*U. S. Mo. Weather Rev., 55 (1927), No. 3, pp. 130, 131, figs. 2*).—From a study of temperature and precipitation records of Los Angeles and San Diego, the author concludes that the evidence tends "to indicate that if the March temperature is above normal in the coastal region of southern California the chances would be considerably in favor of precipitation being above normal for the following season, and vice versa."

Weather and forest inflammability in the southern Appalachians, E. F. McCarthy (*U. S. Mo. Weather Rev., 55 (1927), No. 3, pp. 119–122, figs. 2*).—From studies of forest fire weather, carried on by the Appalachian Forest Experiment Station, the author concludes that after the fall of the new litter a fire hazard can be created very quickly through the agency of sun, wind, and low relative humidity on southern exposures, but that this is true to a much less degree on northern exposures. "Conditions of wind, sunshine, and relative humidity favorable to forest fire are the regular aftermath of the passage of a storm,

and can be forecast with more certainty than precipitation. Unusual hazard is caused by continuation of high pressure over or west of the Appalachian region, or by the passing of a storm without precipitation in the region."

Lightning storms and forest fires in the State of Washington, G. W. ALEXANDER (*U. S. Mo. Weather Rev., 55 (1927), No. 3, pp. 122–129, figs. 5*).—In this article the author reports data to show that "lightning storms are of outstanding importance among the meteorological phenomena affecting the fire hazard in Washington, and in the Pacific Coast States in general. Localization of forecasts of such storms is highly desirable. . . . The local occurrence of lightning storms is governed by orographic and climatic conditions, the storms being most frequent in zones of highest summer temperature, with marked convectional activity and up-mountain winds. Given suitable pressure distribution, individual storms follow the march of high temperature from west to east at an interval of 12 to 36 hours after the temperature maxima. . . . The occurrence of fires after storms seems to be limited by the degree of distribution and the amount of accompanying precipitation, rather than by its purely local intensity. The extent of damage from such fires is governed by the seasonal degree of inflammability of the fire material and by the occurrence of fire weather before and after the fires are established."

Climatological data for the United States by sections, [March–April, 1927] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 14 (1927), Nos. 3, pp. [202], pls. 4, fig. 1; 4, pp. [199], pls. 4, fig. 1*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for March and April, 1927.

Weather reports, C. C. GEORGESON ET AL. (*Alaska Stas. Rpt. 1925, pp. 9, 21, 29, 30, 32–41*).—Monthly summaries of temperature, precipitation, and cloudiness recorded at 35 places in Alaska are given, with brief notes on the seasonal weather conditions and their effect on crops at the different experiment stations during the calendar year 1925.

At the Matanuska station "weather conditions on the whole were favorable for crop production, although the early summer was too dry and the late summer too wet for best results. During the growing months the total precipitation was distributed as follows: May, 0.07 in.; June, 2.2 in.; July, 0.7 in.; and August, 3.06 in.; totaling only 6.03 in. The rainfall for the calendar year totaled 20.14 in. and the snowfall for the winter (1924–25) approximately 65 in. The melting snows are absorbed by the soil and supply moisture to crops growing in the early summer when all interior Alaska may suffer from drought. The maximum temperature for the summer, 77° F., occurred in July, and the minimum temperature for the winter, —30°, was in January. The last killing frost of spring occurred May 17, and the first in fall September 23, giving a frost-free period of 129 days."

At the Fairbanks station climatic conditions are somewhat different from those at the Matanuska station, and the daylight period is slightly longer. In 1925, "the last killing frost occurred May 21, and the first killing frost August 23, giving a frost-free period of 93 days, which is 7 day shorter than for the 15-year average. The rainfall was light in the spring and early summer, but sufficient for the growing grain. During the latter part of August and September heavy rains interfered with the work of harvesting and haymaking. October was comparatively mild, with a rainfall of 0.5 in. The frost-free period at Matanuska was 128 days."

In the region of the Rampart station "the winter of 1924–25 was unusually cold, especially during December, January, and February. The daily mean for

January was −29.25°, the minimum temperature was −61°, and the maximum temperature was 0°. The total precipitation for the winter, all in the form of snow melted rapidly. . . . The last spring frost occurred May 18, and the first months of May, June, July, and August. The rainfall of September, 3.65 in., was the highest recorded for the month. The ice in the Yukon broke May 15, and the water continued to rise until May 26, flooding bottom lands to a depth of 10 ft. . . . The first part of May was warmer than the average and the snow melted rapidly. . . . The last spring frost occurred May 18, and the first killing frost August 24, giving a frost-free period of 97 days."

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER, W. H. PARKIN, and E. H. WHEELER (*Massachusetts Sta. Met. Buls. 461–462 (1927), pp. 4 each*).—The usual summaries and notes are given of observations at Amherst, Mass., during May and June, 1927.

SOILS—FERTILIZERS

Lee County soils, R. S. SMITH, O. I. ELLIS, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 37 (1927), pp. [2]+66, pls. 3, figs. 8*).—Lee County comprises an area of 723 square miles, two-thirds of which is in the upland. The county consists of an undulating to rolling plain, becoming rough and hilly toward the north-central and northwestern parts. Drainage is supplied by the Rock River, Green River, and Bureau Creek, with their tributaries, and since the deepening and straightening of the channel of Green River has been for the most part satisfactory. The soils of Lee County are divided into five main groups: The upland prairie soils, the upland timber soils, the terrace soils, the swamp and bottomland soils, and the residual soils, including rock outcrop areas and soils formed in place through rock weathering. Brown silt loam, one of the upland prairie soils, occupies the largest area, covering 48.49 per cent of the total area of the county.

Data on the plant nutrient content of the different soil types are presented, together with information on their fertility requirements and crop adaptations. Information on the interpretation of the soil survey and on the general principles of soil fertility and a supplement containing experimental field data on important soil types are appended.

Woodford County soils, R. S. SMITH, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 36 (1927), pp. [2]+58, pls. 2, figs. 5*).—Woodford County is located in north-central Illinois and includes an area of 531.62 square miles. It presents in general an undulating to rolling topography, the entire county lying in the Illinois River basin, although the central and southern parts are drained by the Mackinaw River. Except for the swampy overflow land next to the Illinois River, both the surface and underdrainage are good.

In this survey four main soil groups are recognized, namely, upland prairie soils, upland timber soils, swamp and bottomland soils, and terrace soils, including alluvial deposits now above overflow. A brown silt loam, 53.38 per cent of the total area, is the most extensive of the types described.

Data on the plant nutrient content of the different soil types are presented, together with information on their fertility requirements and crop adaptation. Information on the interpretation of the soil survey and on the general principles of soil fertility is appended, and a supplement containing experimental field data on various soil types is included.

Soil survey of Iowa—Benton County, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 46 (1927), pp. 72, pls. 2, figs. 8*).—Benton County is located in eastern central Iowa and consists of an area of 455,680 acres, the soils of which are partly derived from loessial material and partly from material of glacial origin. The topography is that characteristic of a

normal, drift-covered prairie plain. The county is drained mainly by the Cedar and Iowa Rivers and their tributaries. The natural drainage system is very well developed, the drainage being adequate in most of the areas, though artificial drainage is needed in some depressed areas in the upland. The soils of this county have been mapped and described by the soils section of the station as 15 series of 26 types under the four groups of drift, loess, terrace, and swamp and bottomland soils. The types covering the largest areas are Tama silt loam, which occupies 48.4 per cent of the total area of the county, and Carrington silt loam, which occupies 11.8 per cent.

The needs of the various soils as indicated by laboratory, greenhouse, and field experiments are discussed. There is a general need for lime, and in some cases the supply of organic matter and phosphorus is rather low.

Soil survey of Iowa—Des Moines County, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 45 (1927), pp. 72, pl. 1, figs. 8*).—This survey deals with an area of 261,760 acres situated in southeastern Iowa and entirely in the Mississippi loess soil area. The upland plain portion of this county has mainly a gently undulating topography. The terrace lands and first bottoms along the rivers are flat and bench-like, the terraces lying from 4 to 20 ft. above overflow. The county is drained by the Mississippi and its larger tributaries, the Flint and Skunk Rivers. About 30,000 acres of bottomland soils are protected from overflow by a levee, pumping stations, large artificial drainage channels, and a reservoir providing the drainage of this section.

The soils of Des Moines County are divided into drift, loess, terrace, and swamp and bottomland soils. These are mapped and described under 17 series of 26 types, together with 0.1 per cent of river wash unclassified. The most extensive types are Grundy silt loam, which covers 31.1 per cent of the area of the county, Clinton silt loam covering 21.6 per cent, and Lindley silt loam covering 11.4 per cent.

The needs of the various soils as indicated by laboratory, field, and greenhouse tests are discussed. All the soils are acid and in need of lime. Most of the soils are fairly well supplied with organic matter, but rather poorly supplied with phosphorus.

Soil survey of Iowa—Greene County, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpt. 44 (1927), pp. 72, pl. 1, figs. 9*).—Greene County, comprising 367,360 acres, is situated in western central Iowa and is included in the Wisconsin drift soil area so that its soils are entirely of glacial origin. In topography it is characteristic of the condition throughout the Wisconsin drift area, having little relief in the uplands and being gently undulating to slightly rolling in the Clarion and Carrington soil areas and level to flat in the Webster soil districts. Natural drainage is adequate throughout a large part of the area, but in many parts of the county areas of insufficient natural drainage are found. In this survey the soils of Greene County are mapped and described in 11 series of 19 types, classified in the three main groups of drift soils, terrace soils, and swamp and bottomland soils. The most prominent types are Carrington loam, covering 53.5 per cent of the total area, and Webster silty clay loam, occupying 26.2 per cent.

The needs of the various soils as indicated by laboratory, field, and greenhouse experiments are discussed. Most of the soil types are acid in reaction, fairly well supplied with organic matter, and respond very largely to the application of a phosphatic fertilizer.

Soil survey of Burt County, Nebraska, L. A. WOLFANGER ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+1493–1530, fig. 1, map 1*).—Burt County, Nebr., is situated in the northeastern part of the State and comprises an area of 304,000 acres. It is in general a rolling upland

country, but has four distinct topographic divisions, (1) the relatively smooth upland, (2) a hilly belt bordering the Missouri River Valley, (3) the Missouri River Valley west of the channel, and (4) the Logan Creek Valley. Drainage is supplied principally by the Missouri River and Logan Creek, the tributaries of which are distributed throughout the county and adequately take care of surplus run-off.

In this survey, prepared in cooperation with the State Soil Survey of the Nebraska Experiment Station, the soils of Burt County are mapped and described as 10 series of 14 types, together with 2.5 per cent of river wash unclassified. The largest areas are occupied by Marshall silt loam, which, with the inclusion of a flat phase, occupies 46.3 per cent of the total area of the county; and Wabash silt loam, which occupies 11.2 per cent.

The composition and distribution of the protozoan fauna of the soil, H. SANDON (*London: Oliver & Boyd, 1927, pp. XV+237, pls. 9, figs. 2*).—The nature and scope of this monograph are clearly stated in the following quotations:

"During the early years of the investigation of any group of soil organisms a considerable part of the work is necessarily devoted to the identification of the forms comprised in the group, and to determining whether they are of general or merely of local occurrence. The present volume was originally planned simply as an account of one more such investigation, differing from others . . . only in being based on the examination of a larger and more varied collection of soils than most . . . other investigators have used. . . . However, it seemed that the time had come when this chapter of soil protozoology could be brought to a close by bringing together all the available records, reconciling wherever possible their mutual inconsistencies and contradictions, and thus presenting for the use of the soil microbiologist and the general naturalist a clear and tolerably complete picture of this group of organisms and of their distribution in the soil."

Any attempt at finality in the present volume is disclaimed, however, attention being drawn to the probable existence in soils of unidentified and possibly unknown protozoa.

"The object of the present work is . . . to pave the way for more detailed inquiries of this kind by giving a general review of the forms of protozoa occurring in the soil, and of the factors influencing their distribution. It is based primarily on the examination carried out at Rothamsted of 148 soil samples obtained from many widely separated parts of the world and representing many different soil types."

Relation of weather, cultural practices, and soil conditions to nitrification in Nebraska soils (*Nebraska Sta. Rpt. [1926], pp. 14, 15*).—It is concluded that subjecting soils to temperatures somewhat beyond 113° F. may be highly stimulative to nitrifying ability, the maximum stimulation being reached at some point which varies with the temperature, the soil, and the moisture content of the soil. Temperatures beyond 131° were found stimulative for a few hours, but generally fatal to nitrifying organisms within one or two days. A condition of dryness below the hygroscopic coefficient was found stimulative, the effect varying with the time up to at least eight months.

In a study of seasonal variation, the lowest nitrification rates were recorded in midwinter after a period of sharp cold. The highest nitrification rates were found immediately after harvest in a cropped plat and in early October in a bare fallow plat. Nitrification rates showed so great a variation between one date and another that the significance of nitrification rate studies on field samples is considered somewhat doubtful.

Studies of soil tilth (*Nebraska Sta. Rpt.* [*1926*], *p. 16*).—The addition of organic matter reduced the force required to shear or cut the soil, but did not reduce plow draft in one set of field plats. On the average, organic matter increased the percentage of coarse granular material as much as 50 per cent.

Soil Moisture (*Nebraska Sta. Rpt.* [*1926*], *p. 32*).—The amount of moisture stored by summer tillage at the North Platte Substation has varied during the last 12 years from 2 to 8.5 in. per season, or from 9 to 40 per cent of the total rainfall of each season. The average was a storage at 4.87 in., or 24.8 per cent of the average seasonal rainfall.

Relation of the potash removed by crops to the active, total, acid-soluble, and acid-insoluble potash of the soil, G. S. FRAPS (*Texas Sta. Bul. 355* (*1927*), *pp. 33, figs. 7*).—A continuation of work previously noted (E. S. R., 53, p. 617).

Factors controlling potash removal by plants include the quantity and form of potash present in the soil, the kind of plant, growth conditions, etc. The quantity of potash removed from soils by solvents is also dependent upon a number of factors, including both the total quantity of potash and the forms in which it is present, the nature of the solvent, the fixing power of the soil, the conditions of the extraction, etc. Active potash was found to increase regularly with the potash removed by the crops up to a value of 600 parts per million of soil, the total potash and acid-soluble potash behaving similarly up to 300 parts per million of crop removal of potash. The weight of crop and active potash in the soil appear unrelated, but active potash in the crop increased with the active potash in the soil. Potash determinations in the crop are always necessary in availability studies, the weight of dry matter alone being unreliable.

The coefficient of correlation between the crop removal of potash and the active soil potash was found to be $+0.742\pm0.019$ for one crop and $+0.794\pm0.014$ for the two crops. The coefficient of correlation between acid-soluble potash and potash removed by the crops was found to be $+0.667\pm0.013$ for two crops. The correlation coefficient for active potash and acid-soluble potash was found to be $+0.761\pm0.019$; that between total potash in the soil and potash in two crops $+0.662\pm0.023$; and those of the total potash to the active potash and to the acid-soluble potash $+0.630\pm0.038$ and $+0.792\pm0.020$, respectively. The acid-insoluble potash is less closely related to the potash removed by the crops, the correlation coefficient between acid-insoluble potash and potash in two crops being $+0.388\pm0.052$.

It is concluded that the active potash is most closely related to the results of pot experiments and is best adapted to show the need of the soil for potash or its ability to supply that element. The corn possibility for potash, defined by the assumption that 1 lb. of potash is required for 1 bu. of corn, is used to designate the number of bushels of corn producible under the pot experiment conditions from the potash taken from the soil. This figure is also used to compare the relative deficiency of the soil in phosphoric acid, potash, or nitrogen.

The effect of lime on the physical properties of soils (*Nebraska Sta. Rpt.* [*1926*], *p. 15*).—Lime did not appear to increase the moisture intake during wet periods, but showed a slight conservation effect during dry periods. In cans of soil exposed out of doors for two seasons lime did not increase the percentage of pore space, but made the soil more friable. Lime with manure, however, or manure alone considerably increased the pore space and rendered the soil ideally friable. Lime only slightly lowered the plow draft, but considerably reduced the force required to shear or cut the soil. Lime altered neither the scouring point nor plastic properties, but reduced the toughness of soil when wet and its hardness when dry. The stability of soil granules was not increased

by lime alone but was increased considerably when lime and organic matter were both added.

The oxidation of sulfur in alkali soil and its effect on the replaceable bases, C. D. SAMUELS (*Hilgardia [California Sta.], 3 (1927), No. 1, pp. 26, fig. 1*).—The literature of biological sulfur oxidation in soils and of the formation of alkaline soils is briefly reviewed; sulfofication experiments in which from 0.15 to 2 per cent of sulfur were mixed with each of four saline to alkaline soils, of which three were taken from barren areas, are described; and a series of experiments on the effect of very dilute (0.0005 N to 0.0250 N) sulfuric acid upon alkaline soils are reported, together with sulfur and sulfuric acid treatments of soils in tanks, and sulfur, sulfur plus gypsum, and sulfur plus calcium carbonate field treatments. The results of these series of experiments are briefly discussed. The observations and conclusions include the following:

The addition of dilute sulfuric acid increased the quantities of soluble sodium and potassium, decreased the quantity of sodium carbonate, and only slightly altered the concentration of silica. On nearly neutralizing the sodium carbonate the concentration of calcium and magnesium increased. On the assumption of an exchange of hydrogen ions, stoichiometric with the increase in soluble sodium, potassium, calcium, and magnesium, the acid added could be accounted for approximately quantitatively. Hydrogen ions were found to function as a replacing agent to a greater extent than did calcium, even though considerable quantities of calcium were made soluble. Dilute sulfuric acid effected a partial neutralization of carbonate to the bicarbonate stage, calcium sulfate precipitating the carbonate as calcium carbonate. The hypothesis is presented that sulfur is oxidized about the particles of calcium carbonate, with the formation of calcium sulfate, and that the organisms concerned utilize more or less of the carbon dioxide formed as a source of carbon. In tank and field trials it was found possible to neutralize the greater part of the alkalinity of soils by the addition of sulfur, and the field trials showed striking improvements in crop yields. Calcium carbonate is very desirable in the sulfur reclamation of an alkaline soil.

[Soil fertilization studies at the Louisiana Sugar Station], W. L. OWEN (*Louisiana Stas. Rpt. 1926, pp. 47–49*).—This station reports the following:

The effect of buried cane trash upon soil nitrate.—Adding undecomposed trash to the soil resulted in a rapid loss of nitrate, but this depressing action upon nitrate disappeared rapidly with the decomposition of the trash. The addition of fresh trash caused a marked increase in the soil fungi and increased the ratio fungi: total number of microorganisms. The depressing effect of trash upon the soil nitrates has been traced to the starch and pentose content of the material.

Adco experiments.—Used on rice straw, the material decomposed satisfactorily, and its physical condition and chemical composition indicated a suitable substitute for barnyard manure.

Three year compost rotation experiment, plots A, B, and C, experiment field, S. STEWART (*Louisiana Stas. Rpt. 1926, pp. 19, 20*).—The 1926 results from plats treated annually with 30 bu. of compost (1) since 1889, (2) since 1908, (3) from 1889 to 1908, and now receiving 200 lbs. per acre of acid phosphate, and (4) the check plat, which has received no fertilizer since the beginning of the experiment, are reported. In general, the three plats divided between these four treatments gave yields of corn, of oats and cowpea hay, and of cotton decreasing in the order in which the treatments are stated above.

Facts brought out by soil experiments, H. J. HARPER and H. F. MURPHY (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 26, 27*).—Soil experiments which led to the following conclusions are briefly reported: Various sources of organic

matter should be better preserved and utilized. The lime needs of the land must be studied when alfalfa or sweet clover are to be grown. Commercial fertilizers are valuable under some circumstances. More attention should be given to the use of legumes as soil builders.

Testing fertilizers for Missouri farmers, 1926, L. D. HAIGH (*Missouri Sta. Bul. 251 (1927), pp. 54, figs. 2*).—This bulletin contains the usual tabulated analyses and guaranties (E. S. R., 55, p. 223) of the fertilizers offered for sale in Missouri in 1926, together with notes on the volume of sales of various fertilizers and general information for the guidance of purchasers.

AGRICULTURAL BOTANY

General botany, C. S. GAGER (*Philadelphia: P. Blakiston's Son & Co., 1926, pp. XVI+1056, figs. 688*).—Though intended primarily for educational use in the United States, this book includes also, as a prominent feature, a discussion of economic plants not cultivated within this area. It is expected that a foundation will be laid in thorough laboratory work. Three chapters by O. E. White deal with heredity, variation, and environment; the physical basis of heredity; and generalizations and special cases. A final chapter deals with evolution.

Aims and methods in the study of vegetation, edited by A. G. TANSLEY and T. F. CHIPP (*London: Brit. Empire Veg. Com. and Crown Agents for Colonies, 1926, pp. XVI+383, pls. [20], figs. [24]*).—The first Imperial Botanical Conference (E. S. R., 55, p. 322) gave attention to the need of scientific study and systematic record as regards the vegetational assets and potentialities of the different parts of the British Empire. As a result, the British Empire Vegetation Committee was organized to promote the survey and study of the vegetation of the Empire, and the present work is a product of that committee.

The object of this book is to place in the hands of the workers on vegetation, material for a beginning and to outline the aims, opportunities, and methods of this work. No standardized, detailed, and exhaustive handbook of methods is attempted, nor is it as yet considered possible. Part 1 is quite general, varied, and comprehensive, part 2 is regional, and part 3 deals with types of vegetation. Institutions and other centers convenient to correspondents are indicated.

Palladin's plant physiology, V. I. PALLADIN, edited by B. E. LIVINGSTON (*Philadelphia: P. Blakiston's Son & Co., 1926, 3. Amer. ed., pp. XXXV+360, pl. 1, figs. 173*).—"While the third American edition, the present one, contains improvements, nevertheless it is, in general, the same as the second [E. S. R., 51, p. 23]. . . . It furnishes a summary of a large amount of literature on the subject. . . . The numerous Russian references supply English-speaking workers with a convenient introduction to the Russian literature of the subject. . . .

"Editorial notes and additions form a considerable portion of the present volume. . . . Dr. Grace Lubin . . . has contributed a brief account of the Askenasy experiment for the demonstration of cohesion in water, a classic experiment with which students of plant physiology appear in general to be but vaguely familiar, although the cohesion of water and the development of strain in that liquid are of the most fundamental importance to an appreciation of the nature of the plant and its activities."

An outline of plant geography, D. H. CAMPBELL (*New York: Macmillan Co., 1926, pp. IX+392, figs. 153*).—Specimens, notes, sketches, and photographs which have been accumulated mainly by the author in many parts of the world, during about 30 years, have been systematized, chiefly according to climatic zones and regional areas. This material forms the basis of the present volume,

which has been elaborated for the general reader and is in sufficient detail, it is thought, to serve as a book of reference to botanists or as a textbook in plant geography.

Plant ecology, W. B. McDougall (*Philadelphia: Lea & Febiger, 1927, pp. VIII+17-326, pl. 1, figs. 114*).—This text furnishes a beginning half-year course in plant ecology, two lectures per week. Suggestions for laboratory and field work are given in an appendix. Recent publications are listed following chapters.

Changes of structure due to a modified environment, E. F. Smith (*Science, 63 (1926), No. 1637, p. 505*).—In a study of the sunflower by the irritation of young meristematic tissues, results were obtained by inoculating with the crown gall organism, indicating that the cysts are independent of tumor formation, but in the case of bacterial inoculations the walls of the cysts bore numerous tumors which were either discrete or fused over long distances. This is said to be the first time that the author had observed cysts in connection with crown galls.

Deficiency of water supply and wilting of the plant as means of increasing its drought resistance [trans. title], I. I. Tumanov (*Trudy Prikl. Bot. i Selek. (Bul. Appl. Bot. and Plant Breeding), 16 (1926), No. 4, pp. 293-399, figs. 5; Eng. abs., pp. 389-395*).—Plants developed under conditions of deficient water supply take on a special characteristic structure and show also specialization in the physiological processes. They resist drought better than do plants reared under normal conditions. Plants are rendered resistant to drought by repeated subjection to conditions of scant water supply. Phases and data are detailed with inferences.

The chemistry of leaves lacking chlorophyll [trans. title], A. Grandsire (*Ann. Sci. Nat., Bot., 10. ser., 8 (1926), No. 3-6, pp. 221-298*).—A systematic report is given, with bibliography of more than 100 titles, on studies with higher plants more or less deficient in chlorophyll as regards material present in the fresh state, dry matter, and ash. Such contents show a tendency to be characteristic, though modified at least by disease, autumnal changes, etiolation, and albinism.

The pectin content of normal and "silvered" apple leaves, F. Tutin (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925-26), pp. 255-257*).—The author records the presence of pectin in apple leaves, noting, however, a perceptibly smaller pectin content in leaves affected with silver leaf disease than in the normal green leaves. In the latter the amount of pectin present is large in comparison with that in peel and pulp of the fresh fruit.

The separation of oxygen by succulents in the absence of carbon dioxide [trans. title], A. Mayer (*Jahrb. Wiss. Bot., 65 (1926), No. 4, pp. 636-638*).—Brief discussion is offered regarding a statement on page 336 of the latest text of Benecke and Jost, which has been noted (E. S. R., 53, p. 623).

The supposed toxic effects of carbon monoxide on green plants [trans. title], C. Wehmer (*Ber. Deut. Bot. Gesell., 43 (1925), No. 4, pp. 184-188, fig. 1*).—Tests with carbon monoxide admixtures applied for 14 days to barley seedlings at a concentration of 25 per cent and to cress seedlings at 10, 20, and 50 per cent gave no evidence of toxic reaction. This result is said to agree with certain others obtained in previous studies by the author, but not with results obtained by employing substances named which are regarded as really toxic.

Nitrate utilization by asparagus in the absence of light, G. T. Nightingale and L. G. Schermerhorn (*Science, 64 (1926), No. 1655, p. 282*).—In a series of greenhouse experiments with asparagus part of the plants were subjected to continuous darkness and others to the seasonal light conditions as they occurred

in the greenhouse. The plants in the light and some of those in the dark were given a complete nutrient solution containing nitrates, while others grown in the dark were given a nutrient solution containing no nitrogen. From these experiments quantitative data were secured, which are said to indicate that asparagus may not only take in nitrates in the dark, but so long as there is a carbohydrate supply present plants appear to be able to build up nitrates to higher forms of nitrogen.

The conditions under which these experiments were carried on are believed to minimize the possibility of bacterial action affecting the results.

The relation of nitrates to tobacco frenching, W. D. VALLEAU and E. M. JOHNSON (*Science, 64 (1926), No. 1655, pp. 278, 279*).—Tobacco frenching is said to be characterized by a chlorotic appearance of the leaves, especially between the veins. In experiments at the Kentucky Experiment Station Turkish tobacco plants, growing in highly organic soil, were found to be especially subject to attack. Further experiments indicated that usually the disease appeared soon after the first evidence of nitrogen deficiency in the lower leaves, and the plants were brought back to normal growth by the addition of a complete nutrient solution or by the addition of nitrogen in some form.

The results of these and other experiments are believed to suggest that frenching is brought about when the rate of carbohydrate metabolism proceeds relatively more rapidly than nitrogen absorption.

The marked similarity between tobacco frenching and apple and pecan rosette is said to suggest that possibly the three diseases are due to a deficiency of available nitrogen.

The effect of ether narcosis on the permeability of plant cells to urea [trans. title], K. HÖFLER and F. WEBER (*Jahrb. Wiss. Bot., 65 (1926), No. 4, pp. 643–737, figs. 2*).—The permeability of plant protoplasm to urea was increased by its subjection to ether at strengths of 1.5 to 2.5 per cent. This permeability change is reversible. These phenomena correspond to conditions of a true narcosis of the plasma. The relations of these facts to particular theories of narcosis is discussed. The general correctness of the view that narcosis lessens permeability is denied.

Effects of boron on plants [trans. title], A. CUSUMANO (*Staz. Sper. Agr. Ital., 58 (1925), No. 10–12, pp. 440–448*).—At strengths below 0.01 per cent boron (boric acid) favored development in *Aspergillus niger*. Several economic plants showed a stimulating action in connection with dilute doses of boron.

Physiological and phytogeographical action of sea salts.—I, Influence of balanced salt solutions on mesophyll and guard cells; review of Iljin's hypothesis of salt stability in plants [trans. title], C. MONTFORT (*Jahrb. Wiss. Bot., 65 (1926), No. 3, pp. 502–550*).—A detailed account is given of the author's own studies, with a bibliography regarding the action of natural and of artificially prepared sea-salt solutions on different leaf tissues of halophytes and of nonhalophytes, together with a review of the hypothesis set forth in a contribution of Iljin, previously noted (E. S. R., 57, p. 25) and of the contrasting views of Stahl (E. S. R., 6, p. 280).

The afterinfluence of plasmolysis [trans. title], R. KAENZEL (*Jahrb. Wiss. Bot., 65 (1926), No. 3, pp. 551–591, figs. 4*).—Death, injuries, and other changes following plasmolysis are dealt with as noted in studies on *Lunularia cruciata*, *Mnium undulatum*, *Elodea densa*, *E. canadensis*, *Lemna trisulca*, and *Coleus hybridus*. It is stated that injury so caused may be in part avoided by adjustment as regards balance in the solutions employed.

On changes of osmotic concentration in certain plants, I. OHGA (*Bot. Mag. [Tokyo], 40 (1926), No. 479, pp. 587–591*).—The author carried out experiments dealing with the effects of variations in osmotic concentration on cells

of wheat, buckwheat, broad bean, and coleus in connection with growth in dry soil, in concentrated solutions, and in normal conditions, the method employed being that of plasmolysis, using sucrose solutions at concentrations usually of from 0.20 to 0.80 but in some cases as high as 1.00 or 2.00 gram-molecular strength.

It is stated that the osmotic pressure of leaves and root hairs of plants normally varies for different growth stages. Restriction of water access increases cell sap concentration. Wheat and buckwheat seedlings when placed in sugar solution higher than that required to plasmolyze the leaf cells wilt at first but recover later and continue to live. Some plants live in 0.80 to 1.00 gram-molecular solutions of sugar, but they develop very slowly.

Sap flow and pressure in trees, D. T. MacDougal and J. B. Overton (*Science, 65 (1927), No. 1677, pp. 189, 190*).—The investigations of the authors are said to support the theory of the upward movement of sap in trees in a cohesive column extending from the menisci in the walls of transpiring cells in leaves extending downward through deadwood cells and vessels and outward through the living cells of the root into the soil.

The authors have given considerable attention to the path of the upward movement of liquid in different types of woody stems and to the analysis of various pressures which may be detected in the cortex, water-filled wood and the gas meshwork in the older wood. With willow, conduction was found to be strictly in the xylem, and the movement in this tract was of a different type and rate from that in the phloem. In the willow, practically all annual rings retain their capacity to conduct, but the individual elements of the xylem possess unequal conducting capacities, the spring and summer wood not being concerned to the same extent. Conduction occurs mainly in the late summer wood of any annual ring near the terminal parenchyma. In the walnut, conduction is also mainly in the late summer wood but not so sharply confined to this region as in the willow. All vessels of the spring wood usually become blocked by tyloses toward the end of the growing season, after which conduction occurs only through the unblocked vessels of the summer wood.

It is claimed that the pattern of the conductive tracts in the pine, walnut, and willow has been made out. It was found that the number of layers occupied by sap and the part of each layer serving as conduits is determined by perforations in pit membranes, by tyloses, and by apical connections with transpiratory systems in leaves.

Transpiration of plants, I–III, A. Burgerstein (*Die Transpiration der Pflanzen. Jena: Gustav Fischer, 1904, [pt. 1], pp. X+283, figs. 24; 1920, pt. 2, pp. VIII+264, figs. 18; 1925, pt. 3, pp. VI+63*).—These three parts collectively constitute a physiological monograph (the work looking toward which is said to have been started as early as 1878) on the phenomena of transpiration of plants. The numbers indicating references as included in the three separate bibliographies run above 1,000, and in part 3 of the present monographic work these are supplemented with lists on osmosis and permeability.

The influence of the young inflorescence on the growth of its stalk [trans. title], H. Söding (*Jahrb. Wiss. Bot., 65 (1926), No. 4, pp. 611–635*).—The author concludes, from a study of several plants named, that the young inflorescence exercises control over the growth of the flower stalk. This influence is thought to be connected with the movement of materials in the stalk; but whether the inflorescence exercises this control by regulation of the flow of nutritive materials or by the production of hormones which diffuse into the flower stalk, or by both means, still remains to be settled.

Analysis of geotropic reaction [trans. title], N. Cholodny (*Jahrb. Wiss. Bot., 65 (1926), No. 3, pp. 447–459, figs. 3*).—Methodology and results are given

of analytic studies on geographic reactions of coleoptiles of *Lupinus angustifolius*, and comparative statements regarding *Zea mays* and *Avena sativa*.

Autotropism of oat coleoptiles in phototropism, conduction of stimulation, and the connection between growth reaction to light and phototropism [trans. title], A. PISEK (*Jahrb. Wiss. Bot., 65 (1926), No. 3, pp. 460–501, figs. 14*).—The work here detailed was done chiefly with coleoptiles of a pure line of oats.

Light sensitivity of tip and stump in coleoptiles of Avena sativa [trans. title], H. SIERP and A. SEYBOLD (*Jahrb. Wiss. Bot., 65 (1926), No. 3, pp. 592–610, figs. 6*).—Under the influence of strong light of different intensities, even the stumps left after removal of root tips of *A. sativa* show variations in behavior. Light limits the growth in absence of the tip in degrees proportionate to the intensity of illumination.

Physiology of germination in meadow fescue grass [trans. title], M. KESTTEING (*Jour. Landw., 72 (1924), No. 4, pp. 237–278*).—The germination rate increases from a minimum at 4.75 to an optimum at 19.24° C., then decreases with its maximum at 38°. It decreases with age. Change of temperature favors germination at all ages, but particularly in case of seed recently harvested. Light promotes germination in young seeds, but limits germination in older seeds. Frost apparently influences favorably the oncoming of germinability. Chlorides of magnesium and manganese at 20 per cent strength, used to soak the seeds for 7 to 8 hours, give a stimulating effect, favoring germinability and vigor of development. Segetan showed a stimulating effect in but a few cases. Pickling solutions lowered infection in the seed bed and generally gave unobjectionable results.

Seed stimulation as a problem in the physiology of germination [trans. title], W. GLEISBERG (*Pflanzenbau [Berlin], 2 (1925), No. 2, pp. 24–27*).—This address, delivered before the zoological-botanical section of the Silesian Society for National Culture, 1925, reviews bibliographically various phases of the problem of seed stimulation.

Factors that influence life and germination of cotton seed, G. F. LIPSCOMB and T. I. DOWLING (*Science, 64 (1926), No. 1651, pp. 186, 187, fig. 1*).—In a previous paper (E. S. R., 50, p. 349) it was shown that cotton seed could withstand high temperatures, depending upon the amount of moisture in the seed, whether placed in dry or moist atmosphere, and whether there is oxygen present during heating. Additional experiments are reported in which the effect of heating the seed in chemically inert gases was investigated. The seed was dried at low temperatures, the different lots placed in tubes containing hydrogen, nitrogen, and carbon dioxide, and subjected to a temperature of 100° C. for 26 hours.

In the hydrogen tubes germination was greatly reduced and the plants lacked vigor. Further studies indicated that the oils in the seed had been changed to such a degree as to prevent their hydrolysis by enzymes for use in the growth of the plants. Nitrogen was studied in the same manner, and again germination was low, due, probably, to the decomposition of the protein in the seeds. Carbon dioxide also brought about a decomposition under the conditions of the experiment, but it was slower than in the case with nitrogen. No germination occurred after 13 hours of heating in an atmosphere of carbon dioxide.

Cereal seed treatment and germination tests [trans. title], P. KROSBY (*Meld. Norges Landbr. Høiskole, 6 (1926), No. 4, pp. 241–290, figs. 10; Ger. abs., pp. 288, 289*).—Trials are described as carried out during 1925–26 in the plant culture section of the Agricultural College of Norway with seed grain in blotting paper and in sand for the purpose of testing preparations of Uspulun

and Germisan in regard to their effects on germination and subsequent plant development.

Fully ripened grain kept at 18 to 20° C. (65 to 68° F.) germinated better in sand than in blotting paper containers, the advantage increasing with the degree of ripeness of the grain. The principal advantage of the sand treatment is thought to lie in the better contact between the grain and the supporting medium, and in the consequently better water supply. The sand method showed a correlation superior to that of the blotting paper method as to both germination numbers in the laboratory (especially energy of germination) and growth energy in the field. The sand culture method (illustrated) as here employed is claimed to be new and advantageous. Both Uspulun and Germisan showed excellent results as to germination, growth energy, and subsequent development.

Report on seed "pickling" investigation, R. M. NATTRASS (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 175–177*).—Germination injury tests of 12 seed samples treated on the farms from three counties are tabulated. The depressing effect of copper sulfate on germination varied from —3 to —21 per cent, with an increase of 6 per cent in the germination of an exceptionally poor sample. Formalin showed only a small depressing effect on germination.

Metabolic assimilation in tobacco leaves during different developmental stages [trans. title], A. I. SMIRNOV (SMIRNOW) (*Trudy Tsent. Inst. Opytn. Tabakovod. [Krasnodar] (Ber. Cent. Inst. Tabakforsch.), No. 29 (1926), pp. 30–51, figs. 3; Ger. abs., pp. 54, 55*).—Tobacco leaves were studied analytically during different developmental stages, first when very small, second when 8 to 10 leaves were present, third when in full bloom, and fourth when in the stage of technical ripeness. The results as regards substances present are detailed.

Developmental conditions for tobacco [trans. title], A. I. SMIRNOV (SMIRNOW) (*Trudy Tsent. Inst. Opytn. Tabakovod. [Krasnodar] (Ber. Cent. Inst. Tabakforsch.), No. 29 (1926), pp. 3–18, fig. 1; Ger. abs., pp. 52, 53*).—An account is given of studies of tobacco in sand cultures with normal nutritive media and of the influence of reaction in the medium on the development of tobacco in water cultures.

The mode of growing of foliage-leaves, sheath-leaves, and bulb-disc in Hyacinthus orientalis, M. C. VERSLUYS (*Rec. Trav. Bot. Néerland., 22 (1925), No. 1–2, pp. 1–108, pls. 2, figs. 5*).—A systematic account is given of growth in *H. orientalis* as regards length, breadth, and thickness, also of cell division and extension in sheath leaf and foliage leaf, and growth of the bulb disk.

Superterranean potato tubers [trans. title], K. G. SCHULZ (*Pflanzenbau [Berlin], 2 (1925), No. 3, pp. 37–39, figs. 3*).—A partial account is given of studies in progress as to the production of tubers on above-ground portions of potato plants.

Two rare types of abnormality in cotton seeds, S. G. LEHMAN (*Jour. Elisha Mitchell Sci. Soc., 41 (1925), No. 1–2, pp. 138–140, pl. 1*).—"In any event the embryological situation herein described represents a rare case of polyembryony in the cotton plant."

A study of Synchytrium [trans. title], A. QUINTANILHA (*Bol. Soc. Broteriana, 2. ser., 3 (1925), pp. 88–195, pls. 4, fig. 1*).—The study here presented of Synchytrium includes the morphology, a history of investigations on the genus, a detailed account of *S. papillatum*, a systematic study of the genus and subgenera or related genera, position and affinities of Synchytrium, and a bibliography covering the period 1868–1924.

GENETICS

[Investigations in plant genetics] (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 35, 36, 40–46, 55, fig. 1*).—Further studies on mutations in Datura (E. S. R., 55, p. 224), reported on by A. F. Blakeslee, J. Belling, G. Morrison, and M. N. Hilliard, were concerned with primary and secondary types, doubling of the chromosome, bad pollen producers, gene mutations, and configurations of chromosomes in nondiploid sets.

Continued studies (E. S. R., 55, p. 225) by M. Demerec cooperating with R. A. Emerson have established the presence of at least 13 genotypically different factors for albinism in corn. It has been found that a large proportion of albinos are determined by duplicate and some by triplicate genes. Demerec has identified 6 multimutating genes in the larkspur (Delphinium), of which 3 produce variegations in leaf chlorophyll and 3 in flower color. The method used in a study of the frequency of somatic mutations in some of these is described.

Concerning the possibility of provoking systematically among plants: (A) The appearance of new vital phenomena; (B) mutation, L. Reychler (*De la Possibilité de Provoquer chez les Plantes Systématiquement: (A) L'apparition de Phénomènes Vitaux Nouveaux; (B) La Mutation. Brussels: Goemaere, 1926, pp. 75, pls. 16, figs. 9; also Eng. ed., pp. 72, pls. 16, figs. 9*).—Having observed plant mutations and having assumed that in order to provoke, systematically, plant mutation it was necessary to produce and develop the individual plant (in the state of sexual elements or of fecundated ovule) under conditions different from those provided by nature, the author conducted certain experiments which are presented in connection with a theoretical discussion.

The appearance of new and hereditary phenomena in plants, which the author claims to have induced experimentally, is held to prove that every modification of the limits between which the interaction of the vital forces of the species goes on in an individual (a modification which manifests itself by the appearance of the mutation) can result from a violent external action in what the author calls the period of dependence. It is claimed that the violent method has operated in the past, and that it still operates in nature in this way. Mutation occurs by leaps, great or small, each leap constituting a potential starting point for great hereditary modifications, sometimes realized quickly, and especially by human intervention. Mutation is, therefore, a phenomenon of evolution. The important problem is the systematic production of mutation, which, it is claimed, has now been at least partly solved.

The English translation is by E. Wilson.

Chromosome number and nuclear volume in Trifolium [trans. title], H. Bleier (*Ber. Deut. Bot. Gesell., 43 (1925), No. 5, pp. 236–238*).—Noting the fact that Trifoliums having like chromosome numbers may have nuclear volumes differing considerably, the author tabulates chromosome numbers against nuclear relative volumes for 18 species of Trifolium.

Albinism in maize [trans. title], W. Mader (*Pflanzenbau [Berlin], 2 (1925), No. 5, pp. 79, 80*).—Albinism in maize is heritable.

Relation of selfed strains of corn to F_1 crosses between them, G. Nilsson-Leissner (*Jour. Amer. Soc. Agron., 19 (1927), No. 5, pp. 440–454*).—An investigation at the Minnesota Experiment Station of the relation between 22 apparently fairly homozygous lines of dent and flint corns and 100 F_1 generations of hybrids between the lines demonstrated that in such material selection among

selfed lines for the characters desired is of value, and that on the average crosses between the more vigorous selfed lines yield better than crosses between less vigorous lines. The better F_1 combinations can only be determined by actual trial. The characters involved in the correlations were yield per hill, length and diameter of ear, number of rows, percentage of second ears, and plant height.

Inheritance of the number of boll locks in cotton and their relation to yield, R. K. KULKARNI (*Agr. Jour. India, 22 (1927), No. 3, pp. 198–200*).—Inheritance studies in the F_2 to F_4 of Gadag No. 1 (*Gossypium hirsutum*) × sea island (*G. barbadense*) gave evidence that parental forms as well as intermediate types could be extracted and bred true, suggesting that out of a splitting generation of a hybrid for boll loculi or a commercial variety of cotton containing plants of low and high values of mean boll lock number pure strains having high values in this regard can be easily and successfully evolved. Four-locked bolls in the cotton studied averaged about 34 per cent more seed cotton than 3-locked bolls. Selection for plants with a higher percentage of 4-locked bolls may result in a higher yielding strain of cotton from a commercial variety, provided other factors concerned with yield remain the same.

Genetic studies in potatoes.—II, The inheritance of red cortical color in tubers, F. A. KRANTZ (*Potato Assoc. Amer. Proc., 13 (1926), pp. 52–55*).—Attention is called to the nature of pigment location in the so-called skin colored varieties of potatoes, and data are given relative to the inheritance of red pigmentation in certain outer tissues of the potato. See also a previous note (E. S. R., 56, p. 429). Tuber color in potatoes embraces skin color, with the pigment in the skin or periderm tissue, and cortical color, with the pigment in the peripheral cortical tissue.

Factors involved in the production of red skin color as shown in progenies derived from the Triumph and Red McCormick varieties include *D*, a basic factor necessary for the development of pigment; *R*, a factor for red color which when present with *D* results in parti-colored tubers; and *A*, an intensifying factor responsible for suffused tuber color. Similarly three factors react together to produce red cortical color, as shown in progenies of the Early Ohio potato. Parti-color on the skin is localized in the bud scales of the eye, while in the cortex it is found at the stem or seed end or under the eye.

The cytology of a tetraploid wheat hybrid (Triticum spelta × T. monococcum), M. C. MELBURN and W. P. THOMPSON (*Amer. Jour. Bot., 14 (1927) No. 6, pp. 327–333, figs. 2*).—The F_1 of *T. spelta* × *T. monococcum* at the University of Saskatchewan (E. S. R., 56, p. 633) was intermediate in most of its botanical characters, although it leaned toward the spelt condition. Heterosis was exhibited in plant height, spike length, and number of flowers per spikelet. The hybrid was completely sterile.

Cytological studies showed that from 0 to 5 bivalent and from 28 to 18 univalent chromosomes appeared at the heterotype division, the bivalents being normal in behavior. Most of the univalents moved into the equatorial plate and divided equationally, although some remained near either pole and failed to divide. The 4 to 18 lagging undivided chromosomes seen at the homotype division were halves of those univalents which divided in the heterotype mitosis, and they wandered at random to the poles to join the others. Because of some chromosome loss at both divisions many of the cells contained supernumerary nuclei, although most of the pollen tetrads were 4-celled. A few tetrads were 5-celled or 8-celled. Hybrids between the different types of wheat evidently may be arranged in a graded series according to chromosome affinities, as judged by the amount of mating and according to the irregularities in the behavior of the univalents.

[Genetic investigations with swine at the Oklahoma Station], W. A. CRAFT (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 34–37*).—Results of the following investigations are briefly reported:

A study of two different systems of breeding, limited-inbreeding and outcrossing when practiced with swine.—Comparative data on the size of litter, mortality, weights, and body measurements of the pigs born in matings of half brothers with half sisters and outcrossed matings are given. The outcrosses show a slight advantage in each consideration at birth, except in the size of the litter, but the differences were not considered as significant. The limited inbreeds averaged 5.2 lbs. heavier at weaning, but in other characters no significant differences were apparent. Surplus animals from both stocks were fattened out to a market weight of 200 lbs., with similar results in rate and economy of gain.

To afford a check on the swine breeding work, lines of guinea pigs were similarly bred, except that strains were started using very desirable and undesirable males, which were found to materially affect the results, and furnish evidence to indicate that segregation of genetic factors for lack of vigor and probably for sterility was occurring in the strain started by the inferior male, while no evidence for such a tendency was apparent in the other strain.

[Inheritance of hair swirl].—In two litters of pigs produced from mating a sow having a pronounced swirl at the coupling with a normal boar, 8 swirled boars and no swirled sow pigs were observed among the 17 offspring. Among 20 F_2 offspring from the unswirled sow pigs mated with their full brothers, only 2 swirled boar pigs were observed. Similar results were obtained in other matings, and so far no genetic analysis has yet been possible.

Effect of time of mating.—Mating 10 sows on the first day of heat, 18 sows on the second day, and 11 sows on the third day of the heat period have so far indicated no significant differences in the size of litters produced.

The swine herdbook as a source of data for the investigation of the sex ratio and frequency of sex combinations in pig litters, H. C. MCPHEE (*Jour. Agr. Research [U. S.], 34 (1927), No. 8, pp. 715–726, fig. 1*).—The results of a statistical study of the frequency of different litter sizes and the sex ratios in each size of litter are given, based on 3,082 litters, comprising 24,004 pigs from the Chester White Swine Record; 2,020 litters from the National Duroc-Jersey Record, by Parkes (E. S. R., 52, p. 629); and 909 litters, comprising 7,854 pigs born in the experimental herds maintained by the U. S. Department of Agriculture at Beltsville, Md.

Among the Chester White pigs there were 48.5 per cent of males and among the Duroc-Jerseys 48.8 per cent of males, while the experimental herd data showed 52 per cent of males. Among the herdbook data there was a marked deficiency of the small and large sized litters as compared with the experimental material. There was also a much larger proportion of litters of 7 and 8 in the herdbook material than would be expected, as compared with the Department data. Upon the application of Pearson's chi-square test for goodness of fit to the percentage of males in each litter size in the three sources of data, such marked divergence from the calculated values based on the experimental material was shown that a fallacy in the hypothesis or faults in the herdbook data were indicated. Further analysis showed that a grouping into the mean sex combinations was evident in both groups of herdbook data, and just as clearly absent from the experimental data, which is considered to be due to a failure to report the actual condition of the pigs at birth. It is concluded that herdbook data are not sufficiently accurate for a study of the sex ratio and frequency of sex combinations due to a failure to report and record accurately the sex of pigs and the size of litters at birth.

FIELD CROPS

[Field crops work at the Alaska Stations], C. C. Georgeson (*Alaska Stas. Rpt. 1925, pp. 2–4, 8, 9–16, 21–27, 30–32, figs. 5*).—Continued experiments with field crops (E. S. R., 55, p. 433) reported on embraced variety tests with wheat, corn, barley, oats, potatoes, alfalfa, and vetch; production trials with the foregoing crops and rye, artichokes, mangels, rutabagas, turnips, sugar beets, carrots, and grain-legume mixtures; trials of potato seedlings and cereal hybrids; a fertilizer test with potatoes; and crop rotations. Potato production and improvement in the territory is discussed briefly.

[Field crops work in Louisiana], S. Stewart, J. M. Jenkins, H. Stoneberg, W. G. Taggart, J. F. Brewster, D. N. Barrow, H. B. Brown, and C. B. Gouaux (*Louisiana Stas. Rpt. 1926, pp. 16, 17, 20–29, 31–36, 43–46, 58–82, 89–92, 104–120, figs. 5*).—Corn breeding work at the station in cooperation with the U. S. Department of Agriculture resulted in a few hybrids between selfed lines which produced large yields of ears with husks showing excellent resistance to earworm and weevil. Trials of sugar cane seedlings are reported on, the merits of various P. O. J. canes being indicated. Certain U. S. and Canal Point seedlings in addition to being immune or strongly tolerant to disease showed great resistance to cold. Extension activities with sugar cane were concerned with varieties on test fields and milling tests, seed selection, root rot complex and cane borer control, and the status of the industry in 1926. The difficulties in testing the feasibility of growing sugar beets in the sugar districts of the State are described at some length, with information on yields and production costs and results of comparative tests and analyses on sugar beet varieties. Beets showed a striking response to phosphoric acid fertilization on hill land. Cotton varieties leading in value of lint and seed included Trice, Lightning Express, Deltatype Webber, Louisiana 63, and strains of Cleveland, Delfos, and D. & P. L.

Rotations, trials of soy bean selections, and tests of sorghum and legume varieties for forage are summarized from the North Louisiana Station. Salsbury, Delfos strains, Deltatype Webber, and Super-Seven led the cotton varieties in acre value, while Salsbury, Alexander Wilt Resistant, and Delfos 0556 made the highest acre yields of seed cotton. Current results in fertilizer tests with cotton are tabulated. White Creole, Hastings Prolific, and Whatley Prolific gave highest yields among the corn varieties.

Seedings made between May 18 and June 15 made the highest yields at the Rice Station, and from 60 to 80 lbs. of seed seemed enough for drilling. Drilled rice heavily outyielded broadcasted rice. Rice on rotated plats made yields greatly in excess of those on plats continuously in rice. Agreeable with earlier results, the use of commercial fertilizer did not seem profitable in rice production on Crowley silt loam. The only available means of controlling the sugar cane beetle, responsible for much damage to rice, i. e., by holding irrigation water until the plants mature and by beginning harvest just after draining, makes harvesting very unsatisfactory. The rôle of the weather in rice production in southwestern Louisiana and the relation of rice consumption to field yields and to types or varieties are discussed briefly.

[Field crops work in Nebraska, 1926] (*Nebraska Sta. Rpt. [1926], pp. 12–14, 22, 23, 27, 28, 32, 35*).—In further breeding work with corn (E. S. R., 55, p. 636), comparison of F_1 single and double crosses between selfed lines and the original varieties gave indications that these crosses must be made anew each year, whereas seed of synthetic varieties may be selected similarly to seed of commercial varieties. Adaptation, found important in corn production under Nebraska conditions, consists largely of growing corn of the correct size for

the length of growing season. Intervarietal hybrids have shown no advantage over the best parent.

Both formalin and copper carbonate seemed entirely satisfactory for controlling stinking smut in wheat, increased yields and improved quality following their application to infected seed. Continued investigations led to the conclusion that although wheats of the same protein content often differ widely in baking quality, the protein content shows a higher correlation with baking quality than does any other known chemical or physical factor or group of factors and continues to be the most important single chemical test. With 112 samples $r=0.304\pm0.058$.

Alfalfa investigations have been reviewed elsewhere (E. S. R., 56, p. 734).

Successively later plantings of potatoes resulted in (a) an increased number of stems, and (b) a decrease and then an increase in total number of tubers and a marked decrease in size of tubers and total production, the yield of marketable tubers being lowered from 100 per cent for the April 16 planting to 15.4 per cent for the July 7 planting. Practically all tubers were formed early in the season, higher yields resulting from enlargement of tubers rather than production of additional tubers. Considering the relation of time of planting of Triumph potatoes on dry land to seed quality, planting before June 15 gave potatoes sufficiently mature for commercial handling, while those planted after July 15 were immature. Tubers from the earlier plantings were lighter in color, considerably more elongated, and scabbier than from the later plantings.

Listed land at the North Platte Substation proved superior to plowed land for wheat. Oats on summer tilled land averaged 20.8 bu. per acre and potatoes on fallow 237 bu., whereas yields on continuously cropped land were 12.9 and 102 bu., respectively.

Good stands of clovers and tame grasses were obtained on subirrigated meadows at the Valentine Substation where the water was within 1 ft. of the surface by either broadcasting or drilling the seed, whereas neither method was satisfactory where water was more than 30 in. down. Inoculation of clover seed seemed beneficial in these tests.

[Field crops investigations in Oklahoma], A. DAANE, L. L. LIGON, F. GRIFFEE, K. KLAGES, H. J. HARPER, H. F. MURPHY, and D. V. SHUHART (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 17–25, 27, 48, 49*).—Experimental work (E. S. R., 53, p. 132) reported on included varietal trials with wheat, oats, corn, grain sorghum, sorgo, cotton, cowpeas, soy beans, lespedeza, alfalfa, grasses, mangels, potatoes, and sweet potatoes; cultivation tests with cotton and kafir; seeding tests with sorghum and sweet clover; fertilizer trials with potatoes and sweet potatoes; breeding work with wheat and cotton; crop rotations; and pasture studies.

Although Kanred wheat has averaged about 2 bu. more per acre than four other varieties recommended for the hard wheat area of Oklahoma, a survey revealed that it is declining in popularity largely because of the development of yellow berry not so prevalent in other sorts. Sixty-five per cent of the farmers were growing Blackhull, 25 per cent Turkey, and about 10 per cent Kanred. Turkey has led the hard wheat varieties in milling and baking tests. During 28 years continuous wheat receiving 10 tons of manure quadrennially averaged 21.31 bu. per acre as compared with 12.58 bu. from unmanured wheat.

In a cultivation experiment with cotton the maximum yield came from deep cultivation after rains. The test results indicate the need of suppressing weeds in order to make fair cotton yields. Twenty-four-in. spacing excelled in a season very dry during most of the fruiting period.

Kafir made its best yields at 8- to 12-in. spacing in 3.5-ft. rows. May 1 has seemed the best time for planting sorghums, with a possibility that sorgos can be seeded earlier than the grain types. A cultural experiment with kafir on soil typical of western Oklahoma showed that if weeds are controlled a good grain yield can be obtained on well-prepared land. The average acre grain yield during 7 years with no cultivation or hoeing was 14.2 bu., weeds hoed 21.8, shallow cultivations 22.1, and deep cultivations 20.4 bu. The most economical practice was shallow cultivation three times during the growing season. The respective yields of kafir, oats, and wheat in rotations were 25.1, 40.6, and 17.8 bu. per acre as compared with 20.8, 36.9, and 12.3 bu. in continuous culture.

[Field crops experiments on the Belle Fourche (S. Dak.) Reclamation Project Experiment Farm, 1923–1925], B. AUNE (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 7–22*).—Outstanding in continued varietal studies (E. S. R., 53, p. 334) were Kota spring wheat, Swedish Select and Silvermine oats, Trebi barley, Payne White Dent corn, Winona and Argentine No. 280 flax, and Bliss and Green Mountain potatoes.

The behavior of crops in the irrigated rotation experiments resembled that recorded earlier. Crops following alfalfa have shown no marked yield increase except when the alfalfa was pastured by sheep or hogs. Application of manure resulted in a decided increase in the yields of sugar beets, alfalfa, and potatoes, and a slight increase in the grain yield. Sugar beets after a cultivated crop have given fairly uniformly good results, whereas the reverse was true when they followed grain without manure or after red clover or alfalfa. Potatoes and corn in rotations including manure or alfalfa gave better yields than without these treatments. Harvesting certain field crops by pasturing with livestock resulted in higher net acre returns than harvesting in the usual manner, and a marked yield increase was made by the crops that followed. During grasshopper infestation the best method was to plant alfalfa alone early in the spring without a nurse crop, although in earlier years seeding after grain harvested in late summer gave the most satisfactory results. Early seeding has given better results in quality and yield than late seeding for spring grains. Fall plowing seemed absolutely necessary for good stands of sugar beets and corn. Rotations are suggested for the locality, and yields and dry-matter content of silage crops under irrigation are tabulated.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot., No. 6 (1927), pp. 4–70, 94–100*).—Investigations reported on by W. H. Parker included trials of winter wheat 1924–25, spring oats and barley, mangels, swedes, and main crop potatoes, all during 1925. A report by A. E. Humphries and R. Hutchinson deals with the quality of wheats from the above trials. The pages also include an account of the Lord Derby Gold Medal Potato Trials, 1926, and papers on Interpretation of Results of Field Trials, by E. S. Beaven, and The Problem of Adaptation of Varieties, by F. L. Engledow.

The influence of several physiographical conditions of the Government of Odessa on crop yields [trans. title], G. I. TANFIL'EV (*Visti Odesk. Silsk. Gosp. Inst. (Mitt. Landw. Inst. Odessa), No. 2 (1926), pp. 36–41, figs. 3*).—The influence of the topography, water basins, wind directions, and coast line of the steppe zone in Ukraine is discussed in relation to crop yields.

Factors influencing crop yields in natural-historical zones of Ukraine [trans. title], S. O. VOROB'EV (*Visti Odesk. Silsk. Gosp. Inst. (Mitt. Landw. Inst. Odessa), No. 2, (1926), pp. 18–26, fig. 1*).—The Ukraine is divided into steppe, forest-steppe, and forest zones. The factors determining crop yields in general are the natural-historical, including climate, soil, and man, and the agricultural, including the ecological status of the plant, improvement, and cultural practices.

Each factor is discussed in relation to each zone, and the possibility of partly avoiding the drought factor in the steppe zone is suggested.

A critical study of forage plants [trans. title], S. VOROB'EV (*Vīsti Odesk. Sīlsk. Gosp. Inst.* (*Mitt. Landw. Inst. Odessa*), *No. 1* (*1925–26*), *pp. 1–75*).—From an extensive consideration of the forage problem in Russia the author emphasizes the importance of studies on the growth peculiarities of the plant, as well as its yields, in response to cultivation and other environmental factors.

Forage plants for dry lands [trans. title], R. OPAZO G. (*Dir. Jen. Serv. Agr.* [*Chile*] *Bol. 133* (*1925*), *pp. 124, figs. 30*).—An extensive discussion of the agricultural and grazing lands in the different subdivisions of Chile is presented, with notes on the characteristics, adaptation, and cultural needs of important native and introduced forage plants. A list of plants poisonous or otherwise harmful to livestock is given.

Observations on the grasslands of the central United States, J. H. SCHAFFNER (*Ohio State Univ. Studies, Contrib. Bot. No. 178* (*1926*), *pp. 56, figs. 12*).—Extensive studies made during 25 years were concerned with the original conditions of the vegetation of the prairies in the region from Columbus, Ohio, to Denver, Colo., changes due to agriculture, grazing, and similar causes, and the relations of the grasslands to agriculture.

In the region indicated there are three great plant formations, deciduous forests, tall grass prairie, and short grass plains formations. The transition between the typical forest and prairie is an oak-hickory association, and the transition between the true prairie and the plains is a mixed *Andropogon furcatus-A. scoparius* association. In both cases the change from the transition to the drier associations is quite abrupt, although there is a broad zone of dovetailing of the contiguous formations. The important primary associations of the ordinary levels and their order of occurrence westward are as follows: Forest formation (1) oak-hickory, and (2) *Quercus stellata-Q. macrocarpa* associations; prairie or tall grass formation (3) *A. furcatus*, (4) *A. furcatus-A. scoparius*, and (5) *A. scoparius* associations; and plains or short grass formation (6) *Bulbilis dactyloides*, (7) Bulbilis-Bouteloua, and (8) *Bouteloua gracilis-B. hirsuta* associations.

Cereals in ancient Greece.—I, Production, A. JARDÉ (*Les Céréales dans l'Antiquité Grecque.—I, La Production. Paris: E. de Boccard, 1925, vol. 1, pp. XVI+237, fig. 1*).—This treatise on cereal culture in ancient Greece describes the species, cultural methods, soils, and cropping systems employed, indicates the areas devoted to grain production, and discusses such economic conditions and factors as land tenure, demand, revenues, and prices. Statistics of grain production in Greece in 1921 are appended with a list of literature cited.

Time of cutting wheat and oats in relation to yield and composition, A. C. ARNY and C. P. SUN (*Jour. Amer. Soc. Agron., 19* (*1927*), *No. 5, pp. 410–439*).—The effect of harvesting wheat and oats at several stages of development (maturity and nine successive days prior thereto) on the yield and quality of grain was studied at the Minnesota Experiment Station during 1925.

Failure of the yields per acre, weights per bushel, and weights per 1,000 kernels of wheat and oats cut at early stages of maturity and cured in the shock to approach those cut at later stages seemed to indicate that materials were not translocated to any extent from the straw to the grain after cutting. Additional evidence was had in that weights per 1,000 kernels from the various cuttings were as great when dried rapidly in the oven as when cured slowly in bags or shock. The bushel weight of grain cut 7 days early was not depressed enough to change the market grade as compared with cutting at maturity.

The comparatively large percentage of green kernels disappeared when the grain was cured slowly in the shock.

The hull percentages of oats cut before maturity were higher than at maturity, and in oats cut at any stage were as high when dried rapidly in the oven as when cured slowly in the shock, indicating that translocation of materials did not take place to an extent to lower the percentage of hull appreciably. The higher nitrogen content of straw from wheat and oats cut 7 days early and dried rapidly in the oven as compared with slow shock drying where leaching could not occur indicated that nitrogen was moved out of the straw. The nitrogen content of the grain of oats cut 7 days early and shock cured increased somewhat as compared with that dried rapidly in the oven, whereas no increase occurred for wheat.

Is eight pounds of alfalfa seed to the acre sufficient? C. R. MEGEE (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 154, 155*).—Results in seeding tests with alfalfa indicated that when winter hardy seed of a high percentage germination is sown on a well-firmed seed bed with a good drill the seeding rate within certain limits (4.7 to 24 lbs.) does not influence the acre yield of hay during the first 4 years. To meet irregularities in seed quality and seeding equipment the use of from 8 to 10 lbs. per acre of high-quality seed of Hardigan, Grimm, Ontario Variegated, or other hardy varieties is suggested for ordinary conditions.

Blindness in barley, W. A. MILLARD and R. BURGESS (*Univ. Leeds and Yorkshire Council Agr. Ed. [Pamphlet] 151 (1927), pp. 19, fig. 1*).—Experiments with a number of barley varieties indicated that the nonpathological condition termed "blindness," wherein a number of spikelets lack kernels, may be inherent. Through gaping of the glumes thrips becomes an important factor in its extent, and it also depends on locality and climate. Standwell and Plumage were highly susceptible, Brewer Favorite and Golden Pheasant were less affected, and Spratt Archer, Plumage Archer, Archer Goldthorpe, Binder, Primus, and Gold appeared highly resistant. Early seeded crops showed less blindness in 1926 than late-sown barley.

Purity of strain in red clover, E. W. FENTON (*Seale-Hayne Agr. Col. Pamphlet 22 (1927), pp. 11*).—Studies on red clover from many sources showed that a large number of strains currently on sale in Great Britain differ too little for practical importance. For general purposes only the late and early groups need be considered. Dorset Marl seemed useful for early maturity and heavy aftermath, and Cornish Marl and Montgomery red, both late flowering sorts, were late, very hardy, and persistent.

Tasseling and silking as criteria of comparative earliness in corn, P. J. OLSON (*Jour. Amer. Soc. Agron., 19 (1927), No. 5, pp. 454–460*).—Data recorded on 23 corn varieties in the varietal test at the North Dakota Experiment Station gave indications that tasseling and silking may furnish a reliable basis for comparing varieties or strains of corn as to earliness, either serving as the criterion with apparently equal assurance of accuracy. Counts should be made after at least one-fourth of the plants have tasseled or silked, and probably not later than when one-half the plants have reached these stages. Plants were regarded in tassel as soon as anthers had begun to protrude.

Double crossed Burr-Leaming seed corn, D. F. JONES (*Conn. Agr. Col. Ext. Bul. 108 (1927), pp. 6, figs. 2*).—The grain and silage corn described was developed by the Connecticut State Experiment Station during extensive corn breeding investigations.

Some effects of method of application of fertilizers on corn and soils, F. R. SMITH (*Iowa Sta. Research Bul. 104 (1927), pp. 65–104, figs. 37*).—Some of the effects of the method of applying fertilizers on the development of roots,

bacterial action, germination, early growth, maturity, and quality of corn on several soil types were studied in the greenhouse and field. See also a previous note (E. S. R., 57, p. 128).

The 2–12–2 (N–P–K) and 0–12–2 fertilizers used affected the development of both the primary and secondary roots of corn much more than did 0–12–0 fertilizers on the early growth, maturity, and yield of corn appeared to be in the fertilizers were applied in contact with the seed. The desirable effects of fertilizers on the early growth, maturity, and yield of corn appeared to be in proportion to the root development of the plant. Maximum development of both primary and secondary roots was obtained when the fertilizers were applied in the hill and thoroughly mixed with the soil in an area extensive enough to prevent retardation of germination. In greenhouse experiments 2–12–2 and 0–12–2 fertilizers applied in the hill and mixed with the soil decreased nitrate production and depressed the nitrifying power of the soil for 2 weeks after application. The osmotic pressure of the culture solution did not seem to be the only cause of retarded germination. Histological studies showed that the elongation of cells and the rate of cell division were retarded by certain fertilizers independently of the osmotic influence.

Varieties of cotton for the Gulf Coastal Plains of Texas, D. T. KILLOUGH and V. E. HAFNER (*Texas Sta. Bul. 354 (1927), pp. 39, fig. 1*).—Varietal trials with cotton at the Angleton, Tex., Substation during the period 1914–1926, inclusive, showed Mebane, Kasch, Cliett, New Boykin, Lone Star, Acala, and Truitt to be most profitable and well adapted to the humid part of the Gulf Coastal Plains of Texas. A Texas Station strain (No. 804) of Mebane gave the highest average yield of lint during the period 1919–1926. The most profitable varieties were characterized by high lint yields, medium to large size bolls, lint percentages ranging from 34 to 38 and lint from 1 to $1\frac{1}{16}$ in. long, and relatively early maturity.

The number of flowers produced during the first 30 days of the blooming period and the number of days from emergence to first open boll were not found as accurate indicators of earliness as the percentage of the total crop produced by the first three pickings.

Correlation studies on 10 varieties observed for 5 years gave negative correlations between length of lint and (1) yield and (2) percentage of lint, indicating a tendency for the lint yield and for the lint percentage to decrease as the length of lint increases. Positive correlations, significant in only 2 years, obtained between yield and lint percentage indicated a tendency for the yield to increase as the lint percentage increases.

The effect of spacing and time of thinning on the yield, growth, and fruiting characteristics of the cotton plant in 1925, R. H. STANSEL (*Texas Sta. Bul. 360 (1927), pp. 38, figs. 15*).—Spacing and thinning tests with Startex cotton at the station in 1925, an unusually dry year, are reported as supplementing previous work (E. S. R., 56, p. 35). Plants spaced 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, and 36 in. apart in 3-ft. rows were thinned normally at the usual chopping time when they had from 4 to 6 leaves and 28 days later when about 6 in. high and squares were forming.

Late thinning resulted in cotton plants with fewer branches, particularly vegetative branches, shorter branches, and with first branches higher from the ground, and the plants were smaller both in height and diameter than plants thinned at the normal time. Cotton thinned at the usual time bloomed and opened bolls earlier and also produced an earlier crop and larger yields than the late thinned cotton. Close and medium spacings, from 9 to 18 in., made the earliest crop. The size of bolls generally rose as the distance between plants was increased.

No advantages appeared to be gained by late thinning. If late thinning is necessary more plants than usual should be left in the row, since more stunted cotton plants can be left on an acre without crowding than plants which grow normally.

Flax production in Saskatchewan, M. Champlin and J. B. Harrington (*Saskatchewan Univ., Col. Agr. Ext. Bul. 33 (1927), pp. 20, figs. 5*).—This pamphlet describes the factors limiting seed flax production, including weeds, diseases, and insects, discusses varieties and production and harvesting practices, and briefly reports tests on growing flax in combination with wheat and oats.

Kentucky bluegrass in Missouri, B. M. King (*Missouri Sta. Circ. 155 (1927), pp. 11, figs. 4*).—Recommendations based largely on observation and practical experience are made for establishing stands of bluegrass, its use in mixtures, management and improvement of bluegrass pastures, and seed production and marketing.

Uniform stands essential in field pea variety tests, H. W. Hulbert (*Jour. Amer. Soc. Agron., 19 (1927), No. 5, pp. 461–465*).—Further seeding studies (E. S. R., 52, p. 828) with field peas at the Idaho Experiment Station showed that pea varieties should be seeded at rates insuring uniform stands per unit area. The stand permitting the production of maximum yields per plant has not produced the highest acre yield. From 3 to 3.5 plants per square foot appeared to constitute the proper stand for conditions in northern Idaho. Calibration data at Moscow showed that a delivery rate of six seeds per square foot has given optimum stands in every season.

Report of the potato synonym committee on the potatoes sent for immunity trials to the potato testing station, Ormskirk, Lancashire, 1926, R. N. Salaman et al. (*Jour. Natl. Inst. Agr. Bot., No. 6 (1927), pp. 71–77*).—Potato varieties are reported on for synonymity and incidence of wart disease.

Accelerating the sprouting of potato tubers with carbon disulfide [trans. title], P. van der Goot (*Landbouw [Buitenzorg], 2 (1926), No. 6, pp. 415–425; Eng. abs., pp. 423, 424*).—During investigations on fumigation against potato tuber moth van Heurn observed that carbon disulfide caused a stimulated sprouting of most potato varieties studied, even when newly harvested. The author, continuing the study, obtained the best results with 40 cc. of carbon disulfide per cubic meter during 24 hours, although some sorts sprouted equally well with only 25 cc. Results became less favorable with 60 cc., and with higher concentration the vapor appeared to cause the tubers to rot.

In the most favorable cases sprouting occurred after 6 days and the tubers could be planted within a month after fumigation, although most varieties required from 6 to 8 weeks after fumigation before planting was possible. Yield decreases due to fumigation could not be observed.

Results of potato spraying and dusting experiments, 1926, H. C. Moore (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 131–133*).—Russet Rural potatoes treated with Bordeaux mixture spray and with copper lime dust five times between July 22 and September 9, inclusive, grew vigorously, with dark green leaves and very slight injury from leafhoppers and early blight. Sprayed plats averaged 189 bu. of No. 1 tubers per acre, dusted plats 159, and checks 99 bu. In Oakland County tests four applications of the same spray cost $7.06 per acre and of the dust $10.78.

More and better potatoes, E. B. Lancashire and C. T. Gregory (*Purdue Agr. Ext. Bul. 82, rev. ed. (1927), pp. 24, figs. 26*).—Practical instructions are given for growing and handling the potato crop in Indiana.

The significance of color and size of rape seed [trans. title], M. J. SIRKS (*Meded. Landbouwhoogesch. Wageningen, 30 (1926), No. 4, pp. 25–54, pls. 2, figs. 6*).—The red seed found in commercial lots of rape seed appeared to be produced especially in the poorer developed and less mature pods. A correlation existed between red color and lower seed weight, small seed showing red color more often and red seed being lighter than black seed of the same size. In field cultures the larger and black seeds produced taller and earlier blooming plants than did the smaller and red seed. The size and color groupings of seeds were evident in the seed of their progeny, although this phenomena was not observed beyond one generation. The probability of finding heritable differences in seed weight is indicated.

Sugar beet investigations, J. C. OVERPECK (*New Mexico Sta. Bul. 162 (1927), pp. 16, figs. 4*).—Although sugar beets have been grown experimentally by the station at various times since 1892 and continuously since 1916, curly top disease has prevented their successful culture in southern New Mexico. However, fall planted (preferably before September 15) beets have practically all produced seed stalks the following spring. As much as 3,000 lbs. of seed per acre have been obtained on plats, and an average yield of 1,500 lbs. seems possible. The climate permits the beets to remain over winter in the field. Comparative trials at several experiment stations indicated that practically no difference exists between the quality and productivity of New Mexico seed produced in one year and that of other commercial seed. Cultural methods are outlined briefly.

[**Experiments with sugar beet varieties in France in 1926**], E. SAILLARD (*Com. Cent. Fabric. Sucre France, Circ. Hebd., 39 (1927), No. 1985, Sup., pp. [16]*).—The beet and sugar yields and sugar contents are tabulated for 8 French and 6 foreign varieties of sugar beets compared on 18 farms in the sugar beet region of France. The 7 varieties tested during the period 1922–1926 averaged from 17.62 to 18.23 per cent in sugar content and produced from 5,288 to 5,702 kg. of sugar per hectare (2.36 to 2.54 tons per acre). Séhline, Bourdon, and Vilmorin B led in sucrose content, and Mennesson A, Vilmorin B, and Rabbetghe & Giesecke N in production of sugar per hectare.

The distribution of sugar in different forms of the common beets [trans. title], J. BECKER (*Fortschr. Landw., 2 (1927), No. 5, pp. 143–147, figs. 3*).—The experimental data reported appear to show that the disposition of sugar or dry matter differs with the form and variety of the beet, which seems of significance in breeding and cultural experiments.

Germinating sugar cane, D. W. MAY (*Planter and Sugar Manfr., 78 (1927), No. 19, pp. 368, 369, figs. 3*).—The essentials of this contribution from the Porto Rico Experiment Station have been noted from another source (E. S. R., 54, p. 634). Soaking sugar cane cuttings in water or in solutions of lime and of lime with magnesia for an optimum period of about 2 days is said to result in elimination of the cane borer (*Diatraea saccharalis*), quicker and more vigorous germination and growth, earlier irrigation, and higher yields.

Sugar cane improvement at the Pasuruan Sugar Experiment Station: Technique, trend, and results from 1893–1925, inclusive [trans. title], J. P. BANNIER (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1926, No. 19, pp. 545–688, figs. 10*).—This comprehensive report of the sugar cane improvement work carried on at Pasuruan (Pasoeroean), Java, outlines the methods employed in producing and selecting seedlings, describes the trend of the work and technique employed, and records significant results obtained during the period indicated. The behavior of many well-known canes in crossing is shown in some detail.

The raising of seedling canes in Java, C. A. BARBER (*Internatl. Sugar Jour., 29 (1927), Nos. 337, pp. 18–26; 338, pp. 64–73, fig. 1*).—An extensive summary of the above report by Bannier.

The reference book of the sugar industry of the world (*La. Planter, Ref. Book Sugar Indus. World, July, 1926, pp. 28–39, 40–43, 44–47, 53–63, 64–68, 71, 72, figs. 41*).—Among the articles included in this fourth annual review of the sugar industry are the following: The Selections of Seed Cane, by C. W. Edgerton, W. G. Taggart, and E. C. Tims; Cane Varieties Suitable for Natal, by H. H. Dodds; Cane Work at the Tucumán Experiment Station, by W. E. Cross; Colloids in Relation to Cane Sugar Production, by H. S. Paine; The Economic Conditions of the Sugar Industry, by H. Arnstein; The Tropical Plant Research Foundation and Its Work for the Sugar Industry, by W. A. Orton; Sugar—Past and Present—in the Hawaiian Islands, by R. H. King; Plant Food Deficiency and Its Relation to Root Rot, by W. P. Naquin; The Milling Plant—a Brief History of Cane-Milling in Hawaii, by A. F. Ewart and E. Kopke; and Efficiency in the Cutting of Cane in Hawaii.

The response of tobacco to phosphorus fertilizers [trans. title], A. V. OTRYGAN'EV (A. W. OTRYGANIEW) (*Trudy Tsent. Inst. Opytn. Tabakovod. [Krasnodar] (Ber. Cent. Inst. Tabakforsch.), No. 30 (1926), pp. 42; Fr. abs., pp. 39–42*).—Extensive field and pot tests with cigarette tobacco indicated that the variations in the phosphoric acid content of tobacco leaf are very slight compared with those of the contents of nitrogen, potassium, and calcium. Narrow variations were observed even on poor river sand, very responsive to phosphatic fertilizers from the viewpoint of yield, although wide extremes of phosphoric acid were applied. Such extreme applications had practically no effect on the contents of nicotine and nitrogen. Chernozem soil did not respond to phosphorus fertilizers. Superphosphate and sodium acid phosphate led the phosphoric acid sources in the yields obtained.

Georgia bright tobacco fertilization and cigarette leaf growth, E. C. WESTBROOK (*Tobacco, 84 (1927), No. 1, pp. 13, 15, 17, figs. 8*).—Fertilizer tests with bright tobacco at the Georgia Coastal Plain Station (E. S. R., 56, p. 523) in cooperation with the Georgia College of Agriculture and the U. S. Department of Agriculture are described, with particular emphasis on sources of nitrogen, phosphorus, and potassium.

Tobacco in Bulgaria, E. FERNANDEZ-DIAZ (*Le Tabac en Bulgarie. Diss., Univ. Lausanne, 1926, pp. 307, pls. 4*).—This dissertation is concerned with the development of tobacco culture in Bulgaria, production practices and districts, marketing, commercial movement, and the status and prospects of the industry in Bulgaria.

The influence of time and rate of seeding on wheat yields [trans. title], N. S. VAL'KO (*Izv. Opytn. Sev. Kavkaza (Jour. Agr. Research North Caucasus), No. 9 (1926), pp. 69–89, figs. 2*).—Observations on the factors determining the yield of wheat in the Kuban (Caucasus) region gave indications that time of planting and not quantity of seed used is the dominant factor influencing the development and yield of winter wheat. Late planting requires a heavier seeding, depresses the yield and quality of the crop, curtails the vegetative period, is conducive to weed growth, and decreases tillering and the straw: grain ratio. An increased rate of seeding with timely planting does not affect the length of the vegetative period, suppresses weeds, decreases tillering, and shortens the culm. Decreased tillering results in more normal stems and increases the quantity and quality of the grain.

Wheat in South Dakota, E. W. HARDIES and A. N. HUME (*South Dakota Sta. Bul. 222 (1927), pp. 24, figs. 13*).—The principal factors involved in wheat production in South Dakota reviewed herein include the distribution, characteris-

ties, yields, and winter hardiness of varieties, cultural methods and field practices, market classes and grades, and diseases.

Prominent among the varieties have been Marquis, Kota (E. S. R., 54, p. 441), and Ruby spring wheat, Turkey (S. D. 144) winter wheat, notable for winter hardiness, and Kubanka durum wheat. While Marquis and Kubanka have been outyielded by other varieties in their respective classes, they are considered the more desirable for milling purposes. Yield differences are held due to amount of black stem rust and other diseases, time of maturity, and the inherent productivity of the variety.

Wheat made its highest yields at Eureka following drilled and listed corn. Winter wheat seeded in standing corn at the station yielded 20 bu. per acre and that on plowed ground 11.5 bu. Seeding trials suggested March and early April for common spring wheat, not later than April 15 for durums, and early September for winter wheat. At Highmore a 6-pk. acre rate seemed enough for common spring wheat and 7 pk. for durum and at the station 5 pk. for winter wheat.

Wheat production in Saskatchewan, M. CHAMPLIN (*Saskatchewan Univ., Col. Agr. Ext. Bul. 34 (1927), pp. 43, figs. 14*).—The practical information outlined on wheat production in the province is extensively based on varietal, cultural, seeding, and fertilizer experiments made by the department of field husbandry, University of Saskatchewan.

Recent researches on wheat in Russia, N. I. VAVILOV ET AL. (*Internatl. Rev. Sci. and Pract. Agr. [Rome], n. ser., 4 (1926), No. 4, pp. 935–957, pls. 5, figs. 5*).—Summaries are given of recently reported investigations in Russia concerned with the classification, ecology, genetics, and improvement of wheat.

Methods for the testing of seeds, used at the Government's Seed Testing Station at Wageningen, Holland, 1925 (*Methoden van Onderzoek aan het Rijksproefstation voor Zaadcontrole voor het Onderzoek van Zaaizaden, 1925. Wageningen: Min. Binnenland. Zaken en Landb., Dir. Landb., 1925, pp. 20; Eng. trans., pp. 15*).—Rules are provided for the determination of purity, origin, unit and actual weights, moisture content, proportions of hull and kernel, germination percentage and energy, intrinsic value, and presence of disease in samples of agricultural seed, and for cultivation tests.

Distinguishing characteristics of the seed of grasses [trans. title], K. CHRISTOPH (*Pflanzenbau [Berlin], 3 (1926), No. 4, pp. 49–58, fig. 1*).—The shape and dimensions, color, awning, pedicel, pubescence, and glumes are described in comparative tables for 39 important grasses.

The germination of Poa spp., A. NELSON (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 157–174, figs. 9*).—The germination response of four species of Poa to variations of temperature, light, and moisture supply, and the same response of *P. compressa* to solutions of salts and when in soil to all the foregoing factors varied were studied from the viewpoint of the seed analyst.

In the laboratory alternation of temperature generally proved to be the most efficient stimulant, and was followed by light and a solution of potassium nitrate as moisture supply. *P. compressa* was the most sensitive, *P. pratensis* and *P. nemoralis* less so, and *P. trivialis* almost insensible to the variations. In the soil, with *P. compressa*, excess of light (sunlight) proved depressant. Certain salts, e. g., potassium nitrate, sodium nitrate, and ammonium nitrate, were stimulating in solution culture, while salts of lead were depressant. In general, the salts stimulating in solution culture were more depressant in soil than those depressant in the solution.

Inspection of agricultural seeds, H. R. KRAYBILL ET AL. (*Indiana Sta. Circ. 142 (1927), pp. 106, fig. 1*).—The purity, germination percentage, weed seed

content and for legumes the hard seed content are tabulated for 1,336 official samples of agricultural seed obtained from merchants in Indiana in 1926.

***Results of seed and legume inoculant inspection*, 1926**, J. G. FISKE (*New Jersey Stas. Bul. 447 (1927), pp. 92, fig. 1*).—The purity and germination percentage and other data are tabulated for 455 official samples of field crops seed and 35 lawn mixtures, the germination percentage for 1,014 samples of vegetable seed, and the crops, inoculation, number of organisms, and viability guaranties for 62 official samples of legume inoculants.

Official Seed Testing Station for England and Wales—ninth annual report [1926], A. EASTHAM (*Jour. Natl. Inst. Agr. Bot., No. 6 (1927), pp. 78–93, figs. 3*).—The average germination and purity are tabulated and discussed for 22,884 samples of agricultural seed received from different sources in England and Wales during the year ended July 31, 1926.

The official seed-testing station, N. R. FOY (*New Zeal. Jour. Agr., 34 (1927), No. 3, pp. 186–194, figs. 2*).—The average germination and purity and incidence of the principal weed seeds are shown for 8,627 samples of agricultural seed tested at the New Zealand Seed-Testing Station at Wellington during 1926.

Handbook of Iowa weeds, L. H. PAMMEL, C. M. KING, and M. H. BURNS (*Iowa Agr. Col. Ext. Bul. 139 (1926), pp. 64, figs. 118*).—General information on the characteristics, habitat, and control of weeds is supplemented by brief descriptions and eradication methods for an extensive list of Iowa weeds.

The weed flora of Iowa, L. H. PAMMEL, C. M. KING, ET AL. (*Iowa Geol. Survey Bul. 4, rev. (1926), pp. VII+715, figs. 512*).—While this comprehensive work deals primarily with the weed flora of Iowa, it presents much information of value to agronomists, botanists, and others interested in weeds and their control. The book includes contributions entitled Descriptive Manual (pp. 1–429), The General Characters of Seeds (pp. 430–511), Agencies of Weed Seed Dissemination (pp. 574, 575), and Bibliography (pp. 661–671), all by Pammel and King; Morphology of Leaves and Flowers of Weeds, by J. N. Martin (pp. 512–539); Roots and Root-Stocks, by J. C. Cunningham (pp. 540–550); Seasonal Succession of Weeds, by King (pp. 551–560); The Story of Weed Seed Dissemination, by A. Hayden (pp. 561–574); Weed Migration (pp. 576–614), Number and Kinds of Weeds on Different Soils (pp. 615–623), and Injuriousness of Weeds (pp. 624–633), all by Pammel; Parasitic Fungi Harbored by Weeds, by J. C. Gilman (pp. 633–635); Some Economic Insects and Their Relations to Weeds, by F. D. Butcher (pp. 636–639); Weed Eradication, by D. Porter (pp. 640–647); The Effect of Drying Upon Root-Stocks and Roots of Weeds, by R. R. Rothacker (pp. 647–653); Weed Law and Seed Law of Iowa (pp. 654–660); and Glossary, by H. S. Kellogg, Martin, and King (pp. 672–688).

Weeds of New Zealand and how to eradicate them, F. W. HILGENDORF (*Auckland and London: Whitcombe & Tombs, 1926, pp. [1]+251, pls. 9, figs. 116*).—This practical handbook deals in a general manner with weeds and their distribution and control, and gives specific information on the characteristics and control of important New Zealand weeds, arranged by families. Photomicrographs of a number of weed seed are included, together with classification by flower color.

HORTICULTURE

[Horticultural investigations at the Alaska Stations], C. C. GEORGESON (*Alaska Stas. Rpt. 1925, pp. 1, 2, 4–8, 17, 32, fig. 1*).—As noted for the preceding year (E. S. R., 55, p. 438), this report consists largely of brief varietal notes on fruits, vegetables, and ornamental plants. Further observations upon station bred strawberry seedlings (E. S. R., 50, p. 140) suggest the adaptability of

some of the new strawberries to interior regions where the temperature falls to −60° F. At the Matanuska Station Cuthbert raspberries were successfully wintered by bending the canes to the ground and covering them with spruce boughs. Berries and nursery stock were aided in wintering by planting in locations where snow accumulated. Rabbits proved a serious menace to strawberry plants at both the Matanuska and Rampart Stations.

[**Horticultural investigations at the Nebraska Station**] (*Nebraska Sta. Rpt.* [*1926*], *pp. 16, 17*).—In a pruning experiment with grapes the weights of new wood removed in cane and spur pruning were 849 and 861 gm., respectively. The removal of wood over 1 year of age was much greater in the case of cane pruned vines. The type of pruning had little effect on the total amount of new growth. Comparing straw mulch with clean tillage, the mulched vines had the appearance of nitrogen starvation in early spring, but later grew normally. Damage to vineyards resulting from a severe October freeze was most pronounced in the best cultivated areas.

Observations on winter injury in the apple orchard showed the most vigorous trees to suffer the most damage. The Jonathan variety was particularly susceptible to injury. In fertilizer tests manured trees had the largest diameter measurements, but were hardly as productive as the trees receiving acid phosphate. Unfertilized and uncultivated trees made the smallest annual increase in diameter.

In a test of apple seedling stocks, Malinda, Whitney, and Patten Greening gave the most vigorous seedlings. Jonathan and McIntosh seedlings had the highest percentage of crown gall. Apple seeds stored at 36–40° F. began to germinate about February 10, but were held without injury until planting time at temperatures of 33 to 38°. Plum pits stored in moist sand at 35° sprouted and grew well when planted. Apples top-worked on Virginia crab and Hibernal showed little injury from October freezes as compared with whip-grafted trees of the same varieties. The whip-grafted trees showed considerable bark cracking and partial girdling.

[**Horticultural investigations at the Oklahoma Station**] (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 43–48*).—As reported by G. W. Cochran, despite a drop to 18° F. during the blooming season of 1925, many varieties of peaches set a fair crop of fruit, apparently from flowers which were not open at the time of the freeze. Glass substitutes were not found equal by W. W. Wiggin to glass as a covering for hotbeds. Of four treatments utilized by F. B. Cross in growing tomato plants, the one in which plants were transplanted to 4-in. pots from the seed flats was the most successful, and the one in which plants were left in the greenhouse bench until ready for the field was the least successful. Observations by Cochran on trees set in the orchard in 1913 as 1- and 2-year-olds showed no essential differences in size between the trees of the two ages, leading to the suggestion that orchardists might better purchase the lower priced 1-year-old trees. Studies by Cochran of the effect of fertilizers and cultural treatments upon the time of blooming of peach trees failed to show any consistent results, although in one season trees in the straw mulch plat blossomed about three days earlier than those under cultivation. Trees in clean culture followed by a cover crop made the best growth, retained their leaves the latest, and yielded the best fruit. Any system which allowed grass to grow gave poor results.

The McDonald blackberry was found by Cross to be self-sterile but satisfactorily pollinated by the Dallas. Pecan investigations reported upon by D. V. Shuhart showed zinc oxide adhesive tape to be a satisfactory binder in budding, except when the sap flow was on the increase. A successful method of propagation was that in which spring bark grafts of freshly cut limbs were

followed in August by summer patch budding on the limbs where the grafts had failed and again the following spring with spring patch buds.

[Horticultural investigations at the Belle Fourche Field Station], B. Aune (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 22–24*).—Of 13 apples and crab apples planted in an irrigated orchard in 1916 all survived except Ben Davis, which winter-killed the first season. One-year trees were found more successful than older ones, starting quicker and being easier to prune. Crab apples were first to come into bearing and showed extreme bud hardiness, producing some fruit in 1925 despite a freeze of 20° F. during full bloom. Plums planted at the same time also succeeded. An apple and plum orchard of the same varieties planted on the dry land system of culture and maintained under continuous cultivation has also prospered.

Plant introductions, N. E. Hansen (*South Dakota Sta. Bul. 224 (1927), pp. 64, figs. 4*).—In connection with comments upon parentage, brief descriptions are presented of promising fruits, vegetables, forage plants, trees, and ornamentals introduced by the station from the beginning of breeding operations in 1895 up to 1927.

Vegetable gardening, A. J. Macself (*London: Thornton Butterworth, 1927, pp. 239, pl. 1, figs. 51*).—A general discussion from the English viewpoint upon vegetables and their culture.

The effect of phosphorus and other fertilizers on the vegetative growth of squash and cabbage, J. R. Hepler (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 152–157*).—Records taken at the New Hampshire Experiment Station upon the growth of Hubbard squash and Danish Ball Head cabbage growing upon plats receiving a basic application of 20 tons of manure per acre supplemented with various other materials showed a marked beneficial effect of phosphorus in acid phosphate upon the early growth of both crops. In the case of squash, records taken July 8 showed increases in early growth as compared with control plants of 70.5, 51.5, and 91.8 per cent, respectively, for 1,000-, 500-, and 1,500-lb. acid phosphate treatments. At the same time applications of muriate of potash with or without phosphoric acid gave less growth than the controls. Later measurements showed the double manure plat to be gaining on the acid phosphate plats. Measurements taken of cabbage showed some stimulation to early growth on the part of phosphorus but in no measure as striking as with squash. The deleterious effect of potash was again recorded. At the end of the season the yields were practically alike on all plats, the double manure area alone showing any significant gains.

Double and single podding in Alaska peas as affected by environment and heredity, A. J. Delwiche (*Canner, 65 (1927), No. 1, pp. 23, 24, fig. 1*).—Records taken in 1926 upon the production of Alaska pea plants grown from seed harvested in 1925 from plants showing single and double podding habits showed no inheritance of these characters, the ratio of double to single pods being as large in the progeny of single as of double podded parents. The author suggests that environment is probably the most important factor in determining the production of any given type of pods.

Anatomy and development of tomato flower, D. C. Cooper (*Bot. Gaz., 83 (1927), No. 4, pp. 399–411, pls. 2, figs. 7*).—This paper presents the results of a technical study of the tomato blossom, using plants of the Bonny Best and Greater Baltimore varieties.

Effect of potash fertilizer on carrying quality of tomatoes, W. H. Lanham (*Texas Sta. Bul. 357 (1927), pp. 38, figs. 6*).—The results of a series of experiments conducted in the spring of 1926 with tomatoes grown at College Station, Troup, Weslaco, and Iowa Park led to the conclusion that while potash fertilizers increased yields of fruit on the sandy loam soils at College Station

and Troup, they had no consistent effect upon the carrying quality of the fruits. As a measure of carrying quality, fruits were submitted to various rigid tests which included shaking, pressing, and dropping until the fruits were broken.

Chemical analyses made by G. S. Fraps of the fruit and plants from the various fertilizer plats showed a lower potash content in both fruits and plants on the control area than on the potash fertilized plats. The fruit highest in potash was taken from the high potash (8 per cent) area and the plants highest in potash from the 6 per cent area. There was apparently no consistent relation between the amount of potash in the plants and fruit and the resistance of the fruits to shaking, pressing, and dropping, or in the time required for the fruits to ripen in storage.

British wild fruits and how to identify them, R. Morse (*London: Epworth Press, 1927, pp. 64, pl. 1, figs. 42*).—A small illustrated handbook designed to assist in identification.

Experiments on self-pollination of fruit trees [trans. title], K. F. Kostina (*Zap. Gosud. Nikitsk, Opytn. Bot. Sada* (*Jour. Govt. Bot. Gard., Nikita, Yalta, Crimea*), *9* (*1927*), *No. 3, pp. 53–76, figs. 8; Eng. abs., p. 76*).—In studies at the Government Botanical Garden, Nikita, Yalta, Crimea, plums and peaches were found to segregate into distinct groups in respect to self-fertility and self-sterility, but in the apple only a certain tendency to self-fertility was observed. Self-fertile varieties of fruits were apparently more productive than self-sterile kinds. Hand-pollinated plum flowers set more fruits than did those open to natural pollination, but the resulting fruits were apparently exactly alike. A correlation was noted between a parthenocarpic tendency in the apple and self-fruitfulness. Self-fertility and self-sterility in the peach were found to be associated with the structure of the blossom.

A comparison of soil management methods in a young apple orchard, H. D. Hootman and H. M. Wells (*Michigan Sta. Quart. Bul., 9* (*1927*), *No. 4, pp. 135–137, fig. 1*).—Of five systems of soil management, (1) clean culture and cover crop, (2) clover sod and straw mulch, (3) alfalfa sod and straw mulch, (4) alfalfa sod and alfalfa mulch, and (5) the same as 4 with nitrate of soda added, compared in an apple orchard planted at the Graham Substation in 1919, the clean culture plat has led both in respect to growth and to yield. From a practical viewpoint the increases in favor of culture were not large and were offset by a higher maintenance cost. The trees on all five plats made satisfactory growth, and contrary to expectation the supplemental application of nitrate of soda proved of no apparent benefit. The authors suggest that on a fertile, clay soil, such as was used, it is possible to develop an orchard almost from the start under the sod mulch system of management.

Fruit thinning in Missouri, A. E. Murneek (*Missouri Sta. Bul. 252* (*1927*), *pp. 16, figs. 8*).—A discussion of the practices and advantages of thinning apple and peach fruits. Records taken on two lots of Ingram apple trees showed not only a greater yield of No. 1 apples and greater profit from thinned trees but also a greater total yield. Similar observations were made in a Gano orchard. Apple trees yielding from 10 to 15 bu. were thinned at a cost of approximately 8 cts. per harvested bushel of fruit. Thinning is believed to reduce the drain on the tree's vitality, thus aiding in the production of annual crops.

Grades for Indiana apples, F. C. Gaylord (*Indiana Sta. Circ. 141* (*1927*), *pp. 12, figs. 2*).—This brief circular contains descriptive and explanatory material concerning the United States apple grades, which are recommended as a basis for packing Indiana fruit.

Mazzard and mahaleb rootstocks for cherries, G. H. Howe (*New York State Sta. Bul. 544* (*1927*), *pp. 14, pls. 6*).—Observations upon the yield and

growth of sweet, sour, and Duke cherries budded on mazzard and mahaleb roots showed beyond question that mazzard is the better stock for all three groups of cherries. At the end of the first 14 years nearly all the mazzard rooted trees were found to be alive and vigorous, while more than half of those on mahaleb roots had died and most of the remaining were lacking in vigor. Stocks had an effect upon the time of blossoming in the case of sweet and Duke varieties on mahaleb roots, but the time of ripening and the size of the fruits were not significantly affected. Mazzard rooted trees because of their greater size were naturally much more productive. Sour and Duke cherries thrived better on mahaleb roots than did sweet varieties. The fact that mahaleb stocks are easier to bud and less exacting in soil requirements has unfortunately led to their extensive use by nurserymen in recent years.

Relative merits of mazzard and mahaleb root-stocks for cherries, G. H. Howe (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 53–55*).—A discussion of the observations noted above.

Results obtained in breeding plums, R. Wellington (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 51–53*).—A summary of the results of plum breeding studies at the New York State Experiment Station indicates that the best quality seedlings have been obtained from parental combinations which represent high quality. Agen, Golden Drop, Jefferson, and Imperial Epineuse stand out as sources of high quality, and Arch Duke, Grand Duke, Pond, and Yellow Egg as parents of seedlings with large sized fruit.

Blueberry culture, C. S. Beckwith and S. Coville (*New Jersey Stas. Circ. 200 (1927), pp. 28, figs. 21*).—This circular, superseding an earlier one by the senior author (E. S. R., 52, p. 237), discusses soil and cultural requirements, propagation, pruning, harvesting, etc.

Notes on self-fertility of some gooseberry varieties, A. S. Colby (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 138–140*).—Pollination studies with various gooseberries, native, English, and English-American hybrids, showed without exception that self-fertility characterizes this fruit. With the exception of Glendale, all the gooseberries developed more seeds from open than from self pollination. In the case of *Ribes gracile* the increase was from 3 seeds per fruit for self to 41 for open pollination.

A note on raspberry breeding, E. F. Palmer and W. J. Strong (*Sci. Agr., 7 (1927), No. 10, p. 387*).—A brief note pointing out that, although purple-fruited raspberries were secured from crosses in which the black-fruited form was used as the ovule parent, in the reciprocal crosses only red-fruited seedlings were obtained.

[Origin of the Gros Michel banana], S. C. Harland (*[Gt. Brit.] Colon. Off., Colon. Research Com. Rpt. 1924–1925, pp. 8–18*).—An extended world journey to the principal banana producing regions leads the author to believe that the Gros Michel banana is a native of southeastern Asia. Here it was found widely distributed and associated with a number of closely allied varieties. The wide diversity of types of cultivated bananas and the existence of several wild species in this part of Asia lead the author to believe that here is the original home of the banana.

The growth of citrus seedlings as influenced by environmental factors, R. E. Girton (*Calif. Univ. Pubs. Agr. Sci., 5 (1927), No. 3, pp. 83–117, figs. 8*).—Studies at Riverside, Calif., in the laboratories of the Graduate School of Tropical Agriculture showed the roots of grapefruit, sour orange, and sweet orange seedlings growing in solution cultures to have minimum, optimum, and maximum temperature requirements of 12, 26, and 37° C. (54, 79, and 99° F.), respectively. In the oranges the optimum temperature for root hair growth

was 33° and for root elongation 26°. In the sour orange root elongation reached a maximum at pH 6.5 and root hair development was favored by pH 5. Aeration favored both root elongation and root hair development, particularly the latter. That oxygen content of the soil atmosphere influences root growth was shown in the case of sour oranges growing in sand cultures. At 28° growth was inhibited at 1.2–1.5 per cent as a minimum and even at 5–8 per cent a retarding influence was noted. High concentrations of carbon dioxide in the soil atmosphere were found adverse to root development, even in the presence of abundant oxygen.

Valencia late oranges, G. B. TINDALE (*Jour. Dept. Agr. Victoria, 25 (1927), No. 5, pp. 276–279, fig. 1*).—Valencia oranges harvested with care just after they reached maturity and put through a process of sweating in an open shed were stored in experimental chambers at 34, 36, 38, and 40° F. Four months later the fruits were found in good condition with only a minimum of mold. The loss in weight was greatest at 40°, and in the 34° lot the skins of some fruits were dull, indicating the approach of breakdown. The loss from mold was proportionately much larger in a large lot of the same fruit in general storage, leading the author to suggest that good circulation of air is essential. A paper on the storage of the Washington Navel orange was noted earlier (E. S. R., 57, p. 341).

Hastening the germination of oil palm seeds, J. N. MILSUM (*Malayan Agr. Jour., 15 (1927), No. 3, pp. 82–84*).—Freshly cleaned seeds taken from 5-year-old palms growing at the Experimental Plantation, Serdang, were divided into two lots, one of which was planted in an open sand bed and the other underneath glass. Periods of 8 and 13 weeks were required to reach 50 per cent germination in the covered and uncovered beds, respectively, but the final germination was practically equal.

Sterility in Apogon and Pogoniris, F. B. MOORE and A. B. STOUT (*Amer. Iris Soc. Bul. 21 (1926), pp. 2–20, figs. 3*).—A further report (E. S. R., 54, p. 838) upon studies at the New York Botanical Garden on the fruitfulness of iris varieties and species when pollinated with pollen of compatible varieties and upon the results of a large number of unprotected field crosses.

A report on sterility in sixty-five dwarf-bearded irises, R. A. GREENE (*Amer. Iris Soc. Bul. 22 (1927), pp. 40–43, figs. 3*).—Like the above, this is an additional report upon sterility studies with the iris in progress at the New York Botanical Garden.

FORESTRY

National forests of Wyoming (*U. S. Dept. Agr., Misc. Circ. 82 (1927), pp. II+26, figs. 21*).—Similar to that prepared for California (E. S. R., 57, p. 342), this circular contains information concerning the national forests within Wyoming, discussing their location, accessibility, recreational features, timber and grazing resources, etc.

Investigations regarding the most suitable time for sowing coniferous seed [trans. title], E. HEDEMANN-GADE (*Svenska Skogsvårdsför. Tidskr., 25 (1927), No. 1, pp. 5–50, figs. 29; Eng. abs., pp. 47–50*).—To determine the value of cultivation and also the best season for sowing, pine and spruce seeds were planted at monthly intervals in tilled and untilled soil in several different locations in the Province of Stockholm beginning with the departure of frost from the soil up to the first of November. An analysis of the results obtained in the several localities indicated that rainfall had a very important relation to the success of plantations. The quantity of rain falling during the three to four weeks succeeding planting proved a decisive factor, especially on poorer soils which were observed to be peculiarly sensitive to drought. Cul-

tivation prior to planting appeared more essential on poor than on fertile soils and had decidedly less influence with pine than with spruce. In the Province of Stockholm late autumn sowings gave equally as satisfactory results as did early sowings, but it is suggested that seed should not be sown on soil which has commenced to freeze.

A second progress report of the results secured in treating pure white pine stands on experimental plots at Keene, New Hampshire, R. C. Hawley (*Yale Univ. School Forestry Bul. 20 (1927), pp. 23*).—A further report (E. S. R., 47, p. 146), covering data obtained in measurements taken in 1925, 20 years following the establishment of the plats. On the heavily and lightly thinned plats 81 and 75 per cent, respectively, of the original trees have been removed, while at the same time 32 per cent have been lost from natural causes on the control area. The diameter of the average tree in the heavily thinned plat after the 1925 thinning was 11.2 in., as compared with 8.2 in the control area. At the same time the heavily thinned trees averaged 65.1 ft. in height as compared with 60.5 ft. for the nonthinned trees. The total amount removed in the four thinnings from the heavily and lightly thinned plats was 15,294 and 10,056 bd. ft., respectively. The basal areas per acre in the heavily, lightly, and nonthinned plats were 100.85, 125.71, and 203.94 sq. ft., respectively. Determinations of annual growth showed a more rapid development in the thinned stands from 1910 onward. In the period 1921–1925 the differences were not marked, due to exceptional weather conditions. Considering that thinning the stands had reduced the wood capital per acre, it is deemed all the more remarkable that the actual volume increase was larger on the thinned than on the unthinned stands. The volumes expressed as percentages on the heavily, lightly, and nonthinned plats after treatment in 1925 were 58, 70, and 100, respectively.

Among the advantages obtained from thinning were the early financial returns from the sale of timber, healthier trees, and better advance reproduction. As contrasted with light thinning, heavy thinning gave larger returns at each cutting and at the same time produced an equal or greater amount of wood.

Alteration in the form of wholly liberated trees [trans. title], **E. Nyblom** (*Svenska Skogsvårdsför. Tidskr., 25 (1927), No. 1, pp. 51–61, fig. 1; Eng. abs., pp. 60, 61*).—Measurements taken on 122 seed trees, chiefly pine, 10 to 12 years after liberation showed an improvement in form class in those trees which at the time of liberation had a form class of 0.7 or less and a deterioriation in those with a form class of 0.75 or greater. The greater the departure of the original form class from 0.725 the greater was the subsequent change. Growth increment was considerable even in trees over 100 years of age. Observing that seed trees with well developed crowns made the more rapid growth following liberation, the author suggests that heavy thinning during the later life of the stand is a desirable procedure.

Report on the physical and mechanical properties of Pinus patula, N. B. Eckbo (*So. African Jour. Sci., 23 (1926), pp. 467–471*).—The wood of *P. patula* was found to be very light in weight, easily worked, almost nonresinous, readily stained or painted, and suitable for gluing or nailing without splitting. Mechanically the wood was found to be weak, brittle, and soft, and it is at present largely used for box making, although it is considered of potential value for other purposes.

Dry rubber content of Hevea latex from trees in clean weeded areas and in areas under fern growth, F. G. Spring (*Malayan Agr. Jour., 15 (1927), No. 3, pp. 78–81*).—Preliminary records taken upon trees of similar age showed practically equal production whether clean cultivated or weedy.

DISEASES OF PLANTS

Elements of plant pathology applied to agronomy and silviculture, E. MARCHAL (*Éléments de Pathologie Végétale Appliquée à l'Agronomie et à la Sylviculture. Gembloux: Jules Duculot, 1925, pp. XVI+312, figs. 148*).—The first two main parts of this book deal, respectively, with plant diseases due chiefly to lower plant organisms or to so-called viruses and with other diseases classed collectively as physiological. A third part lists, in systematic and briefly descriptive form, plants in their practically determined divisions, with diseases and their causes (chiefly lower organisms).

Diseases and pests of garden plants, M. VAN DEN BROEK and P. J. SCHENK (*Ziekten en Beschadigingen der Tuinbouwgewassen. Groningen: J. B. Wolters, 1925, 4. ed., rev., vols. 1, pp. XII+360, figs. 176; 2, pp. VIII+259, figs. 96*).—This is the fourth, fully revised edition of this work, the second edition of which has been noted (E. S. R., 39, p. 444).

Some outstanding features of the plant disease situation in Illinois during 1923, L. R. TEHON (*Ill. State Acad. Sci. Trans., 17 (1924), pp. 88–93*).—An account of weather conditions as observed during the year is related, with general or detailed and tabulated accounts of diseases affecting fruits, cereals, vegetables, and field crops.

Plant diseases (*Nebraska Sta. Rpt. [1926], pp. 24–27, 28*).—A study is outlined of potato spindle tuber and its combinations with other degeneration diseases, several phases of which have been carried on during the current year. These include the relation of time of infection to appearance and severity of the symptoms, which may be noted within 4 to 8 weeks after infection of the growing plant occurs. In preliminary studies, all attempts failed to transmit calico, weather mottle, and witches' broom by the core graft method. Inoculation from Giant Hill tubers failed to reproduce the disease, but gave some doubtful spindle tuber plants. Nitrate nitrogen was plentiful in infected tubers. No insect appeared to be correlated with spindle tuber spread. The cutting knife was suspected, and this view was supported by preliminary tests and field trials. Some results have been published by Werner in Research Bulletin 32 (E. S. R., 55, p. 447) and elsewhere.

In the determination of differential reactions of strains within a wheat variety to physiological forms of *Puccinia graminis tritici*, not one of 579 pure line strains used proved completely resistant to all 14 forms of rust. Of 100 selected for continued study, about 10 were rather promising for further study.

Of the 93 counties of the State, 84 have been found producing the common barberry, and this has been found rusted in 71 counties. During 6 years, stem rust has appeared on grasses and grains near infected barberries 11 days earlier on an average than the rust which comes from outside the State.

Studies indicated seem to show that most if not all running out of seed potatoes is due primarily to disease, environment being a secondary factor.

"By the tuber index method it was found that no lots of seed potatoes were obtained that were entirely free of known virus diseases, but the method was entirely satisfactory for eliminating mosaic diseases. In one plat mosaic was reduced from 38.2 per cent to 0.7 per cent by 2 years' tuber indexing."

Degeneracy in potatoes under Nebraska conditions has been shown to be due principally to spindle tuber. Higher soil temperatures, when they did not inhibit tuberization, resulted in greatly elongated tubers, the productiveness of which, when planted, was not affected by soil temperature or soil moisture. In a study with seed stock containing some spindle tuber, dry land seed stock was more productive than irrigated stock of the same lot; seed harvested early

was superior to that harvested late; late planting produced better seed than early planting; and straw mulching seemed to retard the spread of spindle tuber. A study of immature potatoes showed that when spindle tuber infected plants were present, immature seed secured by either early harvesting or late planting was superior to mature seed. When disease was not present in seed lots, immature stock showed no advantage over mature stocks. In a study of tuber type, it was found that tuber elongation was increased by raising the temperature, increasing the amount of soil moisture, or growing the plants on a heavier type of soil.

Mycological investigations, W. F. Bewley (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), p. 67*).—The mycological investigations included the Phytophthora disease of cucumber seedlings, the Thielavia disease of beans and tomatoes, and tomato mildew. Diseases brought to the station not previously listed included aster wilt (*Cephalosporium asteris*), celery soft rot (*Bacillus carotovorus*), French bean root rot (*T. basicola*), mushroom disease (*Monilia fimicola*), narcissus rot (bacterial organism not identified), rose canker (*Coniothyrium fuckelii*), *Solanum capsicastrum* edema (physiological), tomato root rot (*T. basicola*), and grapevine canker (*Rhabdospora* sp.).

Report of the imperial mycologist, [Pusa, 1924–25], M. Mitra (*Agr. Research Inst., Pusa, Sci. Rpts. 1924–25, pp. 45–57*).—This report comprises chiefly accounts of studies on diseases of economic plants, including pigeon pea (*Cajanus indicus*) wilt (*Fusarium udum*) and canker (*Nectria* sp.); cinchona (*Cinchona ledgeriana, C.* spp.), collar bark swelling and cracking, lower-leaf cast, and death (*Botryodiplodia theobromae, Corticium javanicum,* and other fungi isolated); sugar cane diseases (*Rhizoctonia* sp., *Colletotrichum falcatum, Cephalosporium sacchari, Verticillium* sp., *Hendersonina sacchari* (?), *Ustilago scitaminea*); linseed wilt (*Fusarium* sp.); berseem (*Trifolium alexandrinum*) disease (Fusarium, Vermicularia, and Rhizoctonia isolated); a cucurbit disease (*Pythium butleri* strains); potato late blight (*Phytophthora infestans*, associated with several fungi); jute disease; oat smut (Uspulun effective); rice disease (several fungi); Phytophthora (strains?); and systematization of hosts and cultures.

Immunity [to disease] in plants [trans. title], A. Zoja (*Atti Ist. Bot. R. Univ. Pavia, 3. ser., 2 (1925), pp. 15–47, pls. 2*).—Theoretical considerations and experimentation are outlined.

It has been found that plantlets reared upon a culture medium used for *Helminthosporium sativum* resist infection with the living forms of that fungus, and that a like immunity is to be noted in the case of plantlets reared on the sap of plants affected with the same disease. The immunizing influence certainly lasts more than one month. The active principle is sensitive to the influence of heat, resisting temperatures between 50 and 55° C., but is destroyed by boiling and is supposed to be enzymatic in character.

Immunity and predisposition in plants to parasites [trans. title], E. Marchal (*Rev. Bot. Appl. et Agr. Colon., 5 (1925), No. 43, pp. 177–182*).—Both passive and active resistance are discussed in connection with physiological and environmental factors.

Bacterial diseases of Gramineae [trans. title], L. Guyot (*Rev. Bot. Appl. et. Agr. Colon., 5 (1925), No. 52, pp. 920–925*).—This is chiefly a review, covering different regions and countries, of the bacterial grain disease situation, partly with reference to French colonial interests.

Tumors experimentally caused by Bacterium tumefaciens [trans. title], J. Magrou (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 1, pp. 73–77*).—The tumor-producing effect of *B. tumefaciens* was tested on *Pelargonium zonale*

with positive results, and some tumors were invaded subsequently by *Botrytis cinerea*. The anatomical relations of tumors are indicated.

Cancer of plants, or crown gall [trans. title], E. F. Smith (*Rev. Bot. Appl. et Agr. Colon., 5 (1925), No. 42, pp. 97–105*).—This is published as a résumé by E. Foëx of an exposition by Smith before the Paris Society of Plant Pathology in 1924 of the essential results obtained in the study of plant diseases, more particularly in relation to bacteria and specifically with reference to plant cancer or crown gall. Attention is called to the extensive bibliography of the subject in Smith's book previously noted (E. S. R., 48, p. 142).

Three new or little known species of Ascochyta [trans. title], M. and Mme. G. Arnaud (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 1, pp. 56–59*).—*Ascochyta caricae* on leaves of *Ficus carica* and *A. syringae* on leaves of *Syringa vulgaris* are descriptively discussed as little known, and *A. hydrangeae* as a new species on leaves and branches of *Hydrangea hortorum*.

Gyroceras celtidis* parasitic on *Celtis australis [trans. title], C. Killian (*Bul. Soc. Hist. Nat. Afrique Nord, 16 (1925), No. 8, pp. 271–281, pls. 4*).—Culture, infection, and microscopic studies are outlined as applied to *G. celtidis*, a parasite of *C. australis*, which in some ways corresponds to the organism which has been designated as *Sphaerella celtidis*.

Pestalozzia diseases so-called and the genus Pestalozzia [trans. title], C. M. Doyer (*Meded. Phytopath. Lab. "Willie Commelin Scholten," No. 9 (1925), pp. 72, pls. 2, figs. 25*).—The first section of this study is mycological (somewhat systematic and critically descriptive), the second is phytopathological, with generalizations; the bibliography comprises about 50 references.

Anomalies in sporulation of Puccinia malvacearum under the influence of grafting [trans. title], L. Blaringhem (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 2, pp. 125–131*).—The author notes, along with other results of tests, that *P. malvacearum* on green *Lavatera arborea* showed two modes of development, but no such development on variegated plants or variegated shoots grafted on normal plants of this species.

Sulfuric acid for weeds and plant parasites [trans. title], E. Rabaté (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 288–298, pls. 2*).—Sulfuric acid has shown itself to be efficacious in destroying injurious weeds, also in combating plant diseases, notably stem break or foot rot of cereals.

Chemical grain disinfectants for smut [trans. title], W. Krassowska and J. Trzebiński (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Puławach (Mém. Inst. Natl. Polon. Écon. Rurale Puławy), 5 (1924), A, pp. 277–293; Fr. abs., pp. 291–293*).—Differences and variations are recorded as noted in work done in 1918, 1919–20, 1920–21, and 1921–22 in applying disinfectants to seed (winter) wheat to minimize smut attack. The preparations employed included Uspulun, Na_2CO_3, K_2CO_3, As_2O_3, $NaAsO_3$, $KMnO_4$, milk of lime, and wood ash, which were tested in comparison with the more usual fungicides, copper sulfate, formalin, and corrosive sublimate.

Cereal diseases [trans. title], L. Guyot (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 258–287*).—The author gives a résumé of the incidence and distribution of cereal diseases in different parts of France, involving among others as fungi known to be causal, *Puccinia glumarum*, *P. triticina*, *P. graminis*, *Erysiphe graminis*, *Tilletia caries*, *Fusarium culmorum*, *Ophiobolus graminis*, *Helminthosporium* sp., and *Leptosphaeria herpotrichoides*.

Foot rot of cereals [trans. title], G. Maunoury (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 299–303*).—Cereal stem break or foot rot caused serious crop losses over certain areas. *Ophiobolus graminis* and *Leptosphaeria herpotrichoides* were present.

A cytological study of orange leaf rust, Puccinia triticina physiologic form 11, on Malakoff wheat, R. F. Allen (*Jour. Agr. Research, 34 (1927), No. 8, pp. 697–714, pls. 7*).—The author presents the results of studies with the wheat strain Malakoff, said to be fully resistant at all ages and under all environmental conditions tested to orange leaf rust (*P. triticina* physiologic form 11). The first article of the series (E. S. R., 55, p. 652) reported a study of this strain on a fully susceptible variety, Little Club.

In the young infections, the first host cells invaded soon collapse and die, many of the young rust fungi dying also at this stage, or else surviving and gaining slowly in strength. Successive host cells invaded show milder and slower reaction, until a haustorium may form, expand partly, and undergo normal drainage, the rate of growth becoming correspondingly increased in case of the mycelium, a few portions of which bear small uredinia. It is suggested that this adjustment process may be one of the factors operative in producing the "X" or "heterogeneous" type of infection described by Stakman and Levine (E. S. R., 48, p. 346).

In infections subjected to bright weather and scant water supply, a zone of host tissue surrounding the infection shows pronounced degradation of the pectic constituents of the cell walls. In seedlings and older plants inoculated during the dark, wet weather of January and February this reaction may be slight or absent. This breakdown of pectic substances may be due to acids formed in the dying and decomposing host cells within the mycelial area, but it is thought to be due to an enzyme from the fungus. The difference in the amount of this pectic reaction in plants subjected to different environmental conditions may be due to a difference in the composition of the mesophyll cell walls brought about by those conditions.

Yellow and brown rusts of wheat.—A preliminary note on their annual recurrence, K. C. Mehta (*Indian Sci. Cong. Proc.* [*Calcutta*], *12* (*1925*), *p. 191*).—No alternate host has yet been discovered for the yellow rust of wheat (*Puccinia glumarum tritici*), and the same is true of the brown rust of wheat (*P. triticina*) as far as India is concerned. No evidence was obtained as to the direct infection of cereals by the sporidia of rusts or as to the causation of rusts by mycoplasmic symbiosis in the seed grain. No source of infection on collateral hosts on the plains of India was found. On account of the intense summer heat there appears to be little likelihood of the survival of uredospores from the previous crop, though uredospores survive the summer at hill stations where climatic conditions are more favorable. Uredospores (supposedly the only source of infection) blown by wind from such localities may, it is thought, start infection on the new crop on the plains.

Wheat yellow rust susceptibility [trans. title], J. Beauverie (*Rev. Path. Vég. et Ent. Agr., 11* (*1924*), *No. 1, pp. 26–28*).—Having noted previously (E. S. R., 53, p. 548) the climatic conditions then favoring exceptional attack by wheat yellow rust (*Puccinia glumarum*), the author herein lists in five grades, with subdivisions, wheat varieties according to relative resistance or susceptibility.

International study of wheat rusts [trans. title], J. Beauverie (*Rev. Path. Vég. et Ent. Agr., 11* (*1924*), *No. 1, pp. 29–31*).—In view of the request made by the International Conference of Phytopathology and Economic Entomology held in the Netherlands in 1923 (E. S. R., 52, p. 645), that specialists in various countries submit propositions looking to coordinated international researches on wheat rusts, the author briefly presents suggestions covering 12 points, with advice as to the wide utilization of the preliminary results obtained

Conditions favoring development and spread of cereal rusts [trans. title], E. Foëx (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 1, pp. 32–41*).—Referring to the presentation by Beauverie, noted above and previously (E. S. R., 53, p. 543), the present author discusses facts, figures, and conditions extending back as far as 1905, with comparisons involving situations at more recent dates. It is regarded as impossible to prove that wheat rust is absent from a given region at a given time, and this fact obscures the question as to overwintering.

Cereal rust at Grignon [trans. title], C. Crépin (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 317–320*).—Resistance to rust fungi of cereal species, subspecies, varieties, and hybrids is indicated with discussion.

[Bean disease in Costa Rica], C. Picado (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 2, pp. 150–155, pls. 2*).—A descriptive account is given of a disease scarring the basal portions of bean stalks or even killing the plants. A Bacterium and a Coccus, possibly acting in association, were isolated from the lesions.

A Sclerotium on maize [trans. title], M. Marchesquelle (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 2, pp. 156–159, fig. 1*).—Near the end of the summer in 1923, the Paris Station of Vegetable Pathology received from Rabat, Morocco, a maize stalk showing an unknown disease. Critical study appeared to establish this as a new species, and it was named *S. monokistum*.

Parasitism of Fusarium which causes the wilt disease of cotton in the Bombay Presidency, B. B. Mundkur and G. S. Kulkarni (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 192*).—A review is given of early work on cotton wilt disease done in India, with a brief account of the literature on the rôle played by aluminum salts on plant life. The conclusion reached by previous workers that aluminum salts become available only in acid soils is accepted, and it has been shown that the cotton soils are not toxic, in the sense that they are not acid, the alkalinity rendering the aluminum salts inactive. The conclusion is that the cotton wilt disease is due to a Fusarium, and that the microchemical tests which showed an accumulation of iron and aluminum salts are not reliable.

Toxins excreted by the Fusarium causing wilt disease of cotton and their influence on the host plants, G. S. Kulkarni and B. B. Mundkur (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 191*).—Cotton plants of a susceptible strain, placed in a filtrate of a solution in which the Fusarium causing cotton wilt disease had grown for a time, wilted, showing symptoms identical with those usually seen in the fields. The time required to wilt the plants varied with the age of the solution. The wilting apparently was not caused by the alkalinity, and while a lactate was found in the filtrate, this was shown not to cause the wilting. The filtrate contained no oxalate. Even resistant types of cotton wilted when placed in the filtrates. The conclusion is reached that the death of cotton plants is due to the toxin or toxins excreted by the fungus, and that these toxins are thermostable and not of an enzymic nature.

The cause of cotton wilt in India, S. L. Ajrekar (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), p. 34*).—Reporting successful inoculations of healthy cotton plants with *Fusarium* sp. isolated from wilted cotton plants from Nagpur and Dharwar, the author states that he considers the reasons offered by Dastur (E. S. R., 53, p. 247) for doubting the parasitism of *Fusarium* spp. not convincing. Some difficulties in the way of accepting Dastur's iron and aluminum salts accumulation theory of cotton wilt are also indicated.

Cotton wilt in Central Provinces and Berar, D. V. Bal (*Jour. Indian Bot. Soc., 5 (1926), No. 3, pp. 117–120*).—This is part of a discussion apparently started by Ajrekar and Bal (E. S. R., 47, p. 46), and since participated in by

Dastur (E. S. R., 53, p. 247) and by Ajrekar (see p. 543). Views and investigations of others are indicated.

"Damping off" of cucumber seedlings, P. H. Williams (*Expt. and Research Sta., Cheshunt, Herts., Ann. Rpt., 11 (1925), pp. 72–74*).—A destructive outbreak of cucumber seedling disease has been brought under study in connection with a Phytophthora isolated about the same time from tomato seedlings. Differences are noted. It is stated that in 1919 a damping off and foot rot of young tomato plants was associated with *P. parasitica* and *P. cryptogea*.

Mosaic disease of the cucumber, W. F. Bewley (*Expt. and Research Sta., Cheshunt, Herts., Ann. Rpt., 11 (1925), pp. 86–89, fig. 1*).—Present results warrant more extended trials looking to control of the cucumber mosaic by the use of clean seed. The strain under examination is not immune to mosaic, being easily inoculated by ordinary methods. Cucumber mosaic can be contracted, apparently, from seed beds which have borne a diseased crop.

Influence of disinfection of millet seed on the appearance of Ustilago panici miliacei [trans. title], W. Krassowska and J. Trzebiński (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach (Mém. Inst. Natl. Polon. Écon. Rurale Pulawy), 5 (1924), A, pp. 273–276; Fr. abs., pp. 274, 276*).—Experimentation in steeping millet seed in potassium permanganate 0.1 and 0.25 per cent, Uspulun 0.6 per cent, formalin 0.25 per cent, soda 1 and 2 per cent, copper sulfate 1 per cent, and corrosive sublimate 0.1 per cent showed that Uspulun was as good a disinfectant as formalin and better than copper sulfate. Soda varied from fair to poor. Potassium permanganate apparently augmented smut infection. Steeping in general lowered smut infection, and the stronger disinfectants are thought to have given increased weight of heads.

A study of a disease of the garden peas due to Sclerotium sp. (rolfsii ?), H. Chaudhuri (*Indian Sci. Cong. Proc. [Calcutta], 12 (1925), pp. 190, 191*).—A disease of potted pea plants is described as appearing in 1923, supposedly due to a Sclerotium (*S. rolfsii* ?).

Potato diseases in 1924 [trans. title], C. Perret (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 309–316*).—In central France during 1924 potato crop returns were considerably reduced by various causes, which as here indicated include phases of degeneration, in connection with the accounts of which resistant varieties are listed.

Hollow heart of potatoes, H. C. Moore (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 137–139*).—In experiments conducted at the station during 1926 to determine the comparative effects of nitrogen, phosphoric acid, and potash, used separately or in combinations, as expressed in the development of hollow heart in Russet Rural potatoes, potash applied alone delayed vine maturity and produced the maximum of hollow heart. The lowest hollow heart percentage corresponded to the combined nitrogen and phosphorus treatment. The complete fertilizer increased yield over the check by 75 bu. per acre and slightly decreased hollow heart, producing 67 per cent of good-type potatoes. The best quality potatoes (78.85 per cent) were given by a combination of phosphorus and potash. All fertilizers averaged somewhat better as to type of potatoes produced than did the check.

The first hollow potatoes were observed August 30, or 82 days after planting. Potatoes dug between September 30 and October 4 showed 10.86 per cent of hollow heart. This trouble increased nearly 100 per cent during approximately the last 10 days of the growing season, the increase being supposedly related to heavy rainfall during September. No hollow heart was found in tubers weighing less than 2 oz. An increase in the number of stalks per hill

decreased the percentage of hollow heart and increased the number and total weight of tubers per hill.

In an experiment conducted in Oceana County, a spacing of 32×16 in. gave 306.2 bu. per acre, with 2 per cent of hollow heart; 32×32 in. spacing gave 289.9 bu., with 13.7 per cent of hollow heart. In Antrim County 34×17 in. spacing gave 384.5 bu., with 7.64 per cent of hollow heart, while a 34×34 in. spacing gave 351.2 bu., with 30.90 per cent of hollow heart.

[Weather and potato blight incidence], M. P. LÖHNIS (*Onderzoek naar het Verband tusschen de Weersgesteldheid en de Aardappelziekte (Phytophthora infestans) en naar de Eigenschappen, die de Vatbaarheid der Knollen voor deze Ziekte Bepalen. Baarn: Phytopath. Lab. Willie Commelin Scholten, 1924, pp. IV+129, pls. 11, figs. 17; Eng. abs., pp. 111–129*).—A systematic account is given of studies carried out on the relation between the weather conditions and the progress of a potato blight epidemic; on experiments for the determination of the time at which spraying with Bordeaux mixture gives the best results; on the infection of tubers and their resistance; on the nature of the factor which may cause the resistance of the cork cambium; on the mode of entrance through the eyes; on the moment at which potato tubers become infected; and on the degree of susceptibility of the foliage.

Potato leaf roll [trans. title], K. LUDEWIG (*Landw. Jahrb., 63 (1926), No. 2, pp. 277–303*).—These studies deal with the effects of salt solutions on the removal of the stored starch from the leaves of plants affected with potato leaf roll and with the influence on leaf roll of phosphorus and potassium as fertilizers. The data are given in tabular form and discussion for 1924 and 1925.

Potato tubers attacked by Micrococcus prodigiosus [trans. title], D. S. CAVADAS (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 1, pp. 19, 20*).—A description is given of potato tubers attacked by *M. prodigiosus*, as to the portions in the different stages of change due to the progress of the disease, i. e., the living reactions and the changes in the dying or killed portions.

Potato powdery scab [trans. title], A. AYOUTANTIS (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 1, pp. 60–66, pls. 3*).—A study at the Paris Station of Plant Pathology on potato powdery scab (*Spongospora subterranea*) is reported by the author in connection with conditions or measures bearing upon protection against loss from this source.

French varieties of potatoes on potato-wart land [trans. title], F. WEISS (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 1, pp. 93–98*).—Chiefly, this is an account of tests for immunity (absolute resistance) or for relative resistance to black wart (*Synchytrium endobioticum*) of potato varieties in connection with the susceptibility or resistance of some also to scab, mosaic, crinkly mosaic, leaf roll and mosaic, Fusarium wilt, Rhizoctonia, and aphid injury.

A strain of sorghum kernel smut which infects milo and hegari, W. H. TISDALE, L. E. MELCHERS, and H. J. CLEMMER (*Phytopathology, 16 (1926), No. 1, p. 85*).—In comprehensive experiments by Reed and Melchers, completed in 1921 (E. S. R., 53, p. 751), milo, feterita, and hegari proved almost completely immune to covered kernel smut (*Sphacelotheca sorghi*). In 1923 a kernel smut attacked milo in southwestern Kansas, northeastern New Mexico, and northwestern Texas, and in 1924 milo and hegari were smutted in this region. Experimentation in 1924 and 1925 showed that the smut from milo and hegari can infect pure lines of milo and hegari and the sorghums susceptible to the commonly occurring strain of *S. sorghi*, but that it does not infect feterita. Covered kernel smut from susceptible sorghums grown at Manhattan, Kans., failed to smut milo or hegari, as formerly. Infected heads of milo and hegari are often only partially smutted by this new strain. The fact that a kernel

smut now exists which attacks varieties hitherto resistant complicates greatly the problem of breeding for resistance. Though characters of the sori and the sterile cells would indicate *S. cruenta*, this fungus is more typical of *S. sorghi*.

Strains of kernel smuts of sorghum, Sphacelotheca sorghi and S. cruenta, W. H. TISDALE, L. E. MELCHERS, and H. J. CLEMMER (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 9*, *pp. 825–838*, *figs. 4*).—This paper presents the results of investigations started as a result of the milo kernel smut outbreak noted above.

Experiments which were conducted at Rosslyn, Va., Dalhart, Tex., and Manhattan, Kans., in 1925 and 1926, to determine the reaction of numerous varieties and hybrids of sorghum to infection by the strain of kernel smut occurring on milo, and by the ordinary covered kernel smut of sorghum (*S. sorghi*), showed that the smut on milo and hegari differs from the ordinary covered kernel smut in that it is pathogenic to milo, White Yolo, and hegari (sorghums hitherto resistant), as well as to sorghums susceptible to ordinary covered kernel smut.

Though externally resembling closely *S. sorghi*, this form shows occasionally certain characters (indicated) of loose smut (*S. cruenta*). Probably the smut on milo and hegari is a strain of *S. sorghi*; possibly a hybrid between *S. sorghi* and *S. cruenta*, resulting from a fusion between hyphae of the two species growing in the same host plant; or possibly an intermediate in a series of variants ranging between *S. sorghi* and *S. cruenta*. A 1921 collection of feterita kernel smut, credited to H. M. Vinall, appears to be due to a strain of *S. sorghi* differing in pathogenicity from the ordinary covered kernel smut and also from the strain in milo and hegari. Loose kernel smut (*S. cruenta*) was found in secondary heads of feterita, C. I. 182 (hitherto free from loose kernel smut) at San Antonio, Tex., in 1926.

Southern blight on soybeans: A new disease in Mississippi, J. M. WALLACE (*Miss. State Plant Bd. Quart. Bul.*, *4* (*1925*), *No. 4*, *pp. 1–5*, *fig. 1*).—During the dry summer of 1924 southern blight (*Sclerotium rolfsii*) was epidemic on soy beans over Mississippi. The occurrence of the disease on the leading varieties is tabulated, but no recommendations are attempted.

[**A Sclerotium spot on sugar beets**], A. M. BARBIER (*Rev. Path. Vég. et Ent. Agr.*, *11* (*1924*), *No. 2*, *pp. 160–163*, *fig. 1*).—An organism associated with rough spots near the insertion of the small roots of sugar beets is said to show sclerotia characters more like those of *S. oryzae* than those of *S. rolfsii* or *S. cepivorum*.

The year's progress in cane disease investigations, H. H. STOREY (*So. African Sugar Jour. Ann.*, *1925*, *pp. 158*, *159*).—Caging experiments showed all uncaged plants to be diseased at the end of three months. One plant only in a cage of the largest mesh was diseased, while all other plants were healthy. This experiment is considered to show that the streak disease is transmitted through the air by some agency which fine wire gauze will exclude. Transmission experiments gave negative results with *Balclutha mbila*, as with other insects tried as likely carriers. Little doubt is expressed that *B. mbila* is the actual carrier, but it is thought probable that only under certain conditions does it become infective. These conditions are to be studied.

Yield tests of disease-resistant sugar canes in Louisiana, R. D. RANDS and S. F. SHERWOOD (*U. S. Dept. Agr.*, *Dept. Circ. 418* (*1927*), *pp. 20*, *figs. 2*).—Extremely low sugar yields recently obtained in Louisiana from the commonly cultivated varieties D-74, Louisiana Purple, and Louisiana Striped (Ribbon), following complete mosaic infection and accentuated injury from bad seasons, root rot, and borers, have seriously menaced the industry.

"From the successive increase of the few short pieces of P. O. J. 234 which Elliott Jones, field manager of Southdown plantation, Houma, La., carried to

Louisiana from the Washington greenhouse in April, 1922, approximately 20,000 acres will have been planted in 1927. This variety, together with P. O. J. 36 and 213 obtained the following year, showed such promise in the Southdown tests that in 1924 the department recommended all three varieties for general trial in the State. . . .

"Results of the first season's comparative plat tests in Louisiana with disease-resistant sugar canes are presented, together with an outline of the Department's aims and methods in the recently inaugurated varietal-testing project."

Sugar cane mosaic [trans. title], A. Kopp (*Rev. Bot. Appl. et Agr. Colon., 5 (1925), Nos. 46, pp. 411–417; 47, pp. 519–526; also Sta. Agron. Guadeloupe, Bul. Tech. No. 1 [1925], pp. 16*).—The author deals with the appearance of sugar cane mosaic in the French Antilles and some facts or views recently elaborated in connection with this trouble. Theories as to causation are reviewed, including or involving bud variation, bacteria, protozoa, soil, physiology, enzym, or virus. The contrasts with streak disease (which affects Uba), as described by Storey, are pointed out. Uba is said to be sometimes susceptible to mosaic. Contributions by about 20 authors are cited.

Streak disease, an infectious chlorosis of sugar cane—not identical with mosaic disease, H. H. Storey (*So. African Sugar Jour. Ann., 1925, pp. 113–118, pls. 2, fig. 1*).—The evidence upon which the author has based his opinion (E. S. R., 53, p. 546) that streak disease of Uba is not mosaic, but a separate and distinct disease of a type somewhat similar to it, is brought out in the present paper.

The streak condition has now been observed in typical, transmissible form in 10 varieties of cane besides Uba. A corresponding disease of maize is supposed to exist. Similar symptoms have been discovered in wild grasses, some of which are listed. The history and the present position of streak are outlined. The infection phenomena are described.

It has been noted that as maize ripens off a marked increase in the proportion of diseased grasses occurs, this fact suggesting that some insect has been driven to seek new food plants, thus spreading the streaking agent. Certain grasses have been found showing the same symptoms in maize as in cane fields. The present separation between mosaic and streak is regarded as fully justified.

Control of streak disease in Uba cane, C. J. Rapson (*So. African Sugar Jour. Ann., 1925, pp. 154–157*).—Recounting experiences, the author claims that the control of cane streak disease depends as much upon good husbandry as upon clean set selection. The disease spreads through the activity of an insect carrier from diseased to sound stalks or ratoons and from infected to clean fields, also, supposedly, from other plants to canes. Spread is proportional to infection material, conditions being the same, though moisture is also influential in this regard.

Wildfire in tobacco plantations of Thrace and Macedonia [trans. title], D. S. Cavadas (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 236–242*).—Tobacco wildfire (*Bacterium tabacum*) is said to have been observed in Greece first in 1920 by B. Ganossis. Though mild in dry, hot years, it may become, under conditions of moisture and lowering of the temperature by rain or hail, very injurious. The disease is said to be transmitted by various other plants, as Petunia, *Solanum melongena*, *Phytolacca decandra*, and *S. lycopersicum* (*Lycopersicum esculentum*). The most hopeful treatment that has been fully tried is Bordeaux mixture.

Tomato leaf mold, P. H. Williams (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), pp. 67–78*).—Preferring the name leaf mold for the tomato disease which is said to be regarded as most important locally and known

to nurserymen as mildew, the mycologist states that this disease, caused by *Cladosporium fulvum*, is known to be transmitted as spores carried by air movements. It appears that moderately strong movements are necessary to dislodge the spores from the pustules, and that the principal cause of the dispersal of spores is the shaking caused by strong winds and the movements of workmen. The data include also spore germination, germ tube penetration, effect of compounds on the fungus, spray effect on foliage, dust and spray effects on the spore pustule, and sulfur dioxide and formaldehyde effects on the fungus.

"Rhizoctonia foot-rot" of the Tomato, T. Small (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), pp. 76–85*).—In Guernsey, a Rhizoctonia foot rot of young tomato plants has caused serious losses annually, and experiments have shown that numerous other plants may be attacked by the fungus, *R. solani*. Varietal susceptibility tests are tabulated, with other information.

The fungus forms sclerotia in the soil, but is completely controlled by steaming or baking. Fungicides were effective only in heavy applications. Warm, dry soil checked the spread of the disease. Atmospheric temperatures of 58.7–67.3° F. resulted in heavy infection. Above 72°, with fairly dry soil, the severity diminished, and above 80° little infection occurred even in very moist soil.

Recommendations include steaming, drying, aeration, hoeing, sunshine, ridge planting, and destruction of weeds in and about the houses.

Root-rot of the tomato caused by Thielavia basicola, P. H. Williams (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), pp. 74, 75*).—In April, 1925, wilted tomato plants examined showed a root rot and brown stem interior, yielding *T. basicola*. Temperature might have been a controlling factor, as artificial inoculations did not succeed.

Some observations on winter injury in Utah peach orchards, December, 1924, T. H. Abell (*Utah Sta. Bul. 202 (1927), pp. 28, figs. 15*).—Low temperature in December, 1924, destroyed a large portion of the stone fruit crops of Utah and caused much injury to the trees, noted largely as cambial discoloration in the trunks and lower branches. Careful note was made of the effect of various types and amounts of injury on the subsequent behavior of the trees. Cambial discoloration, where darkest, was correlated generally with severest injury and extensive dying in both branches and trees. Old trees showed a higher percentage of killings than did young trees.

Predisposing factors included low vitality, poor soil, insufficient water in 1924, exposed locations, and peach tree borers. Severe pruning of the trees in January after the freeze, removing most of the live buds at the branch tips, caused frequent killing. Young trees stood severe pruning somewhat better than did old trees. Varietal differences in hardiness were observed. Temperatures of −20° F. or lower caused the most severe injury, and a temperature of −16° was followed by small fruit crops. Practically all young trees of stone-fruit species made good recovery in the course of the summer of 1925. Blackheart, frost cankers, death of branches and trees, and perhaps wrinkled apples (Jonathan) were common results of the cold weather. Weakening and death of trees in 1927 appeared to be associated with blackheart. Crotch cankers frequently resulted in limb breakage.

Suggestions or recommendations included the location of orchards on good soil, the use of high bench lands, increase of soil fertility, maintenance of adequate water supply during summer, the elimination of borers, thinning of fruit in dry years, delay in the pruning of old trees, and the elimination or cleaning out and protection of frost cankers.

Plum rust [trans. title], V. DUCOMET (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 262–267*).—Almost every year plum trees in southwest France are attacked by rust (*Puccinia pruni-spinosae*). The relations of the hosts to these and other fungi are discussed.

Mosaic of raspberries, W. H. RANKIN (*New York State Sta. Bul. 543 (1927), pp. 60, pls. 8*).—Mosaic has brought about the virtual abandonment of red raspberry culture in New York, has occasioned serious loss in the purple variety Columbian, and has caused some damage in black raspberries. Leaf curl is seldom found in the State, and localized and partial leaf mottling, called mild mosaic, is supposed to be due simply to infestation and feeding at a certain stage by the European red mite.

Symptoms in black raspberries which are supposed to be variable expressions of mosaic (the principal symptoms of which in red and purple raspberries are mottling of leaves and dwarfing of canes) include necrotic effects in canes and leaves, general yellowing, dwarfing, rosetting, and effects previously described as streak. Red raspberry virus also causes mosaic in black raspberries.

Aphis rubiphila and *Amphorophora rubi* both live on raspberries during the entire season, but other aphids are rare. The large aphids of *A. rubi* are readily dispersed by wind or rain, thus reaching new plants. The first and second instars of *A. rubi* proved infective, but older stages, including adults, failed to infect. The differences as regards infectivity between young and more mature instars are thought to indicate a variable relation between the aphid and the virus and to show, supposedly, that aphid feeding activities are not always necessarily or equally inoculative. It has been found that a definite variation occurs in the rate of spread in mosaic in red varieties under uniform conditions, some varieties escaping inoculaton under conditions conducive to high infective rates in case of other varieties, though the escaping varieties are not necessarily immune or even resistant.

"Klendusity [the term here used in place of 'disease escaping'] is apparently due to an external relation between the variety and the infective stage of the aphid vector, while resistance and susceptibility are determined by the internal relation between host cell contents and the virus."

Aphiscides do not appear promising in connection with control measures. The rate of spread of mosaic in the varieties Cuthbert and Marlboro is slightly more rapid in western New York than in Ontario, Canada. In the lower Hudson River Valley mosaic spreads very rapidly in these varieties. The rate of spread was measured in 28 named varieties of red raspberries at Geneva, and it was possible to divide them into four classes as to relative klendusity and into five classes as to relative susceptibility, these not being correlated factors. Cuthbert, June, and Ontario are only slightly klendusic and moderately susceptible. Herbert and Latham are the important varieties which exhibit high klendusity. The former is very susceptible, the latter more resistant than other standard varieties, except Ranere. Black raspberries are more susceptible than red raspberries, the injury is more serious, and the plants soon die. Mosaic incidence is high in black raspberries when they are grown near mosaic red raspberries. Varieties of black raspberries exhibit marked differences in klendusity, Plum Farmer being highly klendusic and Cumberland lacking klendusity.

Mosaic control by roguing in Cuthbert, Herbert, June, and Ontario was successful at Geneva, the annual mosaic incidence being less than 2 per cent. Cuthbert, June, and Ontario stock from these sources showed from 10 to 30 per cent mosaic after one season in rogued plats in the lower Hudson River Valley. In a planting of over 35 varieties of red and purple raspberries at Geneva, rogued for five seasons, the average annual mosaic was reduced from

30 to 4 per cent, and 24 of the varieties were mosaic free in the fifth season (1926).

Mosaic-free stock and roguing of standard varieties are recommended as practicable methods of avoiding loss from mosaic in western, central, and northern New York. The more klendusic or resistant varieties, as Herbert Latham and Ranere may be successful in the lower Hudson River Valley.

Controlling raspberry mosaic (*New York State Sta. Bul. 543, pop. ed. (1927), pp. 7, pls. 2, fig. 1*).—This is a popular edition of the above.

The yellow rust of raspberry caused by Phragmidium imitans, S. M. Zeller (*Jour. Agr. Research [U. S.], 34 (1927), No. 9, pp. 857–863, figs. 4*).—Red raspberry yellow rust (*P. imitans*) is reviewed as to its incidence, its description, and its life history, in particular as to the uredinial stem lesions. The infection of second-year or fruiting canes near the ground is considered as the most serious phase of the disease, since the resulting lesions produce brittleness and diminish the sap-conducting tissues, so that canes are easily broken in trellising and the rise of sap may become insufficient for complete maturity of the fruit. Drastic elimination of old leaf and cane refuse offers the most practical of control methods that have yet been proposed.

Raspberry diseases in Iowa, I. E. Melhus and O. H. Elmer (*Iowa Sta. Circ. 105 (1927), pp. 15, figs. 7*).—This discussion of symptoms, causal organisms, and control relates only to those raspberry diseases which are known to be serious in Iowa, including anthracnose (*Plectodiscella venetum*), Septoria leaf spot (*Mycosphaerella rubi*), orange rust (*Gymnoconia interstitialis*), crown gall (*Pseudomonas tumefaciens*), mosaic, leaf curl, and winter injury (sometimes followed by *Coniothyrium fuckelii*).

A disease of the strawberry plant, T. Small (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 11 (1925), p. 85*).—Diseased strawberry plants submitted for examination in October had apparently healthy crowns, but the roots showed black and rotted cortex. Nematodes and hyphae were present in root cortex and in leaf petioles. Of the six fungi isolated and tested, one, always pathogenic and recoverable from the lesions, may prove to be a strain of *Diplodina lycopersici*.

Citrus canker scouting report (*Miss. State Plant Bd. Quart. Bul., 4 (1925), No. 4, p. 18*).—No infection was found during 1923–24 on any of the 130 properties in four Mississippi counties that had shown citrus canker since its first appearance in 1916. These properties were declared no longer danger centers.

Sabal causiarum (Cook) Beccari: A new host of the coconut bud-rot fungus, C. M. Tucker (*Jour. Agr. Research [U. S.], 34 (1927), No. 9, pp. 879–888, figs. 4*).—A disease affecting the "hat" palm (*S. causiarum*) in Porto Rico is reported and described as observed in 1926. The plants showed symptoms which were described as being like those of the coconut bud rot (*Phytophthora palmivora*), which was reported as absent from the western coast in 1923 but as present in 1926 in 320 dead or dying coconut palms. Bud rot appeared about the same time on both of these hosts, the diseased specimens of the two trees being intimately associated.

A Phytophthora isolated from *S. causiarum* was indistinguishable morphologically and culturally from a coconut-infecting strain of *P. palmivora*. Both strains were slightly pathogenic to wounded eggplant fruits and distinctly pathogenic to wounded papaya seedlings, but not pathogenic to cacao fruits, or to cacao, roselle, *Erythrina poeppigiana*, breadfruit, and eggplant seedlings. The results of inoculations of 10 unwounded coconut palms with each strain as noted are considered to have established *S. causiarum* as a host for *P. palmi-*

vora, and to have indicated the necessity for its eradication to control coconut bud rot. There was some evidence of slightly decreased virulence in the coconut strain grown on culture media for two years. It is stated that three hosts of the coconut bud rot fungus have been established, namely, *Cocos nucifera*, *Borassus flabellifer*, and *S. causiarum*. It is thought probable that *C. plumosa* should be added to the list.

Bud or crown diseases slightly resembling bud rot are said to have been reported on *Roystonia regia* in Cuba and Mauritius and on *Elaeis guineensis* in Java, Sumatra, and Malaya, but it has not been shown that either of these palms is susceptible to invasion by *P. palmivora*.

A Japanese chestnut disease caused by a new Coryneum [trans. title], J. Dufrénoy and M. Gaudineau (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No 2, pp. 164–167, pls. 2*).—Japanese chestnuts produced from seed obtained from Japan are said to show in the Department of Ardèche a defoliating bark disease associated with a Coryneum. This was not identified with any of the American or European species, which are listed.

The combat against chestnut black canker according to J. Dufrénoy [trans. title], A. C[hevalier] (*Rev. Bot. Appl. et Agr. Colon., 5 (1925), No. 48, pp. 614–618*).—A résumé is given of chestnut black canker, largely as dealt with by Dufrénoy (E. S. R., 56, p. 55; 57, p. 354), with brief additional notes on that disease and the situation it is causing in regions designated.

Perithecia of Microsphaera quercina in southwest France [trans. title], J. Raymond (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No 4, pp. 254–258, figs. 3*).—The author reports the presence on oak (*Quercus pedunculata*) leaves (both surfaces) of perithecia of *M. quercina*. It is thought that the characters of the perithecia in this region, as described, are due to adaptation and not to exterior (climatic) influences.

Walnut rot [trans. title], M. Gard (*Rev. Bot. Appl. et Agr. Colon., 5 (1925), No. 43, pp. 217–222*).—Reviewing recent studies, including his own, on walnut root rot, characterized by the presence in the root cortex of whitish festoons of *Armillariella mellea*, which also penetrates deeper, the author states that the rot attacks the trees in general successively, not simultaneously, over a given area. Appropriate measures are indicated.

The Phomopsis disease of conifers, M. Wilson ([*Gt. Brit.*] *Forestry Comn. Bul. 6 (1925), pp. 34, pls. 12*).—This account of the Phomopsis disease of conifers (*P. pseudotsugae*), rendered in technical language and claimed to present results of much original research by the author, includes a history of the disease; the synonymy and relationships of the causal organism; comparisons of this with other species of Phomopsis on conifers; the distribution of the disease in Britain; the morphology of the fungus; cultures on artificial media; the disease on the Douglas fir (*Pseudotsuga douglasii*), the blue Douglas fir (*P. glauca*), the Japanese larch (*Larix leptolepis*), the European larch (*L. europaea*), *Abies grandis*, and other species; a brief account of control measures (mostly indirect); and a bibliography of 42 titles.

White pine blister rust in the West, C. R. Stillinger (*Calif. Dept. Agr. Spec. Pub. 54 (1925), pp. 80–82*).—The white pine blister rust situation in the West as developed since its appearance there in 1921 is reviewed. The general policy is to find practical methods for the removal of currants and gooseberries for the actual protection of white pine timber. Eastern methods are not quite applicable. Methods used locally appear to have cost more than in the East.

Eradication of cultivated black currant in Oregon in relation to the white pine blister rust situation, C. A. Park (*Calif. Dept. Agr. Spec. Pub. 54 (1925), pp. 78–80*).—Apparently blister rust had not, at the time of this report, reached Oregon. It had been found in western Washington on only three pines,

and these well north of Seattle. The presence of cultivated black currants constitutes a grave menace to the pines. Agencies are listed, and measures are outlined looking to eradication.

Spores from diseased pines were caught in airplane traps up to 5,000 ft., and infection was found on currants 110 miles north of the known limit of white pines and at least 150 miles from the nearest pines known to be infected. Other significant features are the spread of the infection into the dry territory, and the discovery of the serious character of the disease on sugar pine, when introduced into Europe.

Enemies of timber: Dry rot and the death-watch beetle, E. G. BLAKE (*London: Chapman & Hall, [1925], pp. XVII+206, pls. [10], figs. [12]*).—Of the two main portions of this book, the first (pp. 1–104) deals with timber dry rot (*Merulius lachrymans, Coniophora cerebella,* and *Polyporus vaporarius*) and the second (pp. 105–198) principally with the death-watch beetle (*Xestobium tessellatum*), but also in one chapter with the common furniture beetle (*Anobium punctatum*).

ECONOMIC ZOOLOGY—ENTOMOLOGY

Alaska Game Law and regulations and Federal laws relating to game and birds in the Territory (*U. S. Dept. Agr., Bur. Biol. Survey, Serv. and Regulat. Announc. (A. G. C. No. 1), 1925, pp. 24, fig. 1*).—This gives the text of the Alaska Game Law, act of January 13, 1925, followed by regulations for the protection of game animals, land fur-bearing animals, and birds in Alaska; regulations of the Alaska Game Commission relating to guides, poisons, and resident trapping licenses; bird refuges in Alaska; the Lacey Act, regulating interstate commerce in game; the law protecting wild animals and birds and their eggs on Federal refuges; regulations restricting hunting on national forests; provisions of the tariff act regulating importation of plumage, game, etc.; and personnel of the Alaska Game Commission.

Laws and regulations relating to game, land fur-bearing animals, and birds in Alaska (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comm. Circs. 2 (1926), pp. 32, figs. 3; 3 (1927), pp. II+29, figs. 3*).—These are revisions of the regulations above noted.

Rat control, J. SILVER (*U. S. Dept. Agr., Farmers' Bul. 1533 (1927), pp. II+21, figs. 10*).—This practical account supersedes Farmers' Bulletin 1302, previously noted (E. S. R., 49, p. 351).

Rat and insect destruction, M. F. DE BRUYNE (*Ontratting en Desinsectie. Proefschr., Tech. Hoogesch., Delft, 1926, pp. VIII+212+3, pls. 19*).—This is a somewhat extended account of control work conducted largely through fumigation, and particularly with Clayton gas and with hydrocyanic acid gas.

Bulletin of the International Committee for Bird Protection, T. G. PEARSON ET AL. (*New York: Internatl. Com. Bird Protect., 1927, pp. 52, pl. 1, figs. 16*).—A brief account of the committee's formation, purposes, and principles, together with reports from the various countries represented.

Key-catalogue of the crustacea and arachnoids of importance in public health, C. W. STILES and A. HASSALL (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 148 (1927), pp. IV+197–289*).—This is intended as part of a fairly comprehensive working reference index to the subject of medical and veterinary zoology.

Proceedings of the Third International Entomological Congress, Zurich, 1925, edited by K. JORDAN and W. HORN (*Verhandlungen des III. Internationalen Entomologen-Kongresses, Zürich, 1925. Weimar: G. Uschmann, 1926, vols. 1, pp. 72, pl. 1; 2, pp. 646, pls. 20, figs. 60*).—Part 1 of this report

(pp. 1–72) is of an introductory nature and deals with the business proceedings, with a list of some 290 official delegates.

Part 2 (pp. 1–646) is largely devoted to the 54 papers that were presented at the congress, as follows: (1) The Geographical Distribution of Insects in Switzerland, by F. Ris (pp. 1–19); (2) Atypical Wasp Nests, by A. von Schulthess Rechberg (pp. 20, 21); (3) Teleological and Phylogenetic Considerations in Ethology, by A. Handlirsch (pp. 22–28); (4) The Development of Applied Entomology in Germany, by K. Escherich (pp. 29–37); (5) On the Early History of Entomology and the Influence of the First Centuries of Christianity (pp. 38–52) and (6) On the Unsatisfactory Condition of Systematic Entomology, Particularly in Germany, and the Remedy Proposed (pp. 53–69), both by W. Horn; (7) Colony Formation by Ants, by H. Eidmann (pp. 70–77) (8) Paolo Lioy as a Dipterologist; Notes on Lindner's Work with Diptera, by H. Schmitz (pp. 78–93); (9) Mutualism of Pomace Flies and the Yeasts of Wine, by E. Sergeant and H. Rougebief (pp. 94–99); (10) Some Unsolved Problems of Butterfly Migration, by C. B. Williams (pp. 100–108); (11) Vertical Illumination of the Microscope in the Study of Insect Anatomy, by P. Vonwiller (pp. 109, 110); (12) The Phylogeny of Nematocerous Diptera: A Critical Review of Some Recent Suggestions, by F. W. Edwards (pp. 111–130); (13) *Agrotis tecta* Hb. and Other Forms, by A. Corti (pp. 131–133); (14) On the Systematic Position of Oryssidae, by H. Bischoff (pp. 134–144); (15) The Polyhedral Body Diseases of Insects, by H. Prell (pp. 145–168); (16) An Attempt to Apply the Mathematical-Statistical Methods to Systematic Entomology, with a Description of a New Bark Beetle, *Ips feiferi*, and Notes on *I. erosus*, by S. Kéler (pp. 169, 170); (17) On the Origin of the Lepidopterous Fauna of North and Central Europe, by W. Petersen (pp. 171, 172); (18) On a Revision of the African Termites, by Y. Sjöstedt (pp. 173–175); (19) The Bucco-Pharyngeal Tract in the Scoliids and in *Chalicodoma muraria* F., by E. Bugnion (pp. 176–183); (20) A New Contribution to the Knowledge of the Species and to the Bionomics of Myrmecophilous Histerids, by A. Reichensperger (pp. 184–203); (21) On the Lepidopterous Fauna of Hungary, by A. Zerkowitz (pp. 204–215); (22) The Oligophagy of Leaf Mining Insects in Its Significance for the Solution of Phytophylogenetic Problems, by M. Hering (pp. 216–230); (23) Some Investigations of the Distribution of Pselaphidae and Staphylinidae (Coleoptera), by O. Scheerpeltz (pp. 231–245); (24) Hymenopterous Myrmecophiles, by C. Ferrière (pp. 246–248); (25) The Woolly Apple Aphis (*Eriosoma lanigera* Hausm.) in Japan, with Special Reference to Its Life History and the Susceptibility of the Host Plant, by K. Monzen (pp. 249–275); (26) The Varying Color in the Immature Migratory Locusts, a Biological Enigma, by A. Dampf (pp. 276–290); (27) On the Knowledge of Gynandromorphous Hymenoptera, by H. Bischoff (pp. 291–295); (28) The Importance of Machilidae (Order Thysanura) in the Explanation of Some Zoogeographical Problems, by J. Stach (pp. 296–301); (29) A Method of Mounting Small Hymenoptera, by I. Kryger (pp. 302–304); (30) The Proportion of Sexes in the Sexual and in the Parthenogenetic Species, by A Pictet (pp. 305–322); (31) The Geographical Distribution of Hemiptera, by G. Horváth (pp. 323–330); (32) The Mimicry of Ants, by E. Wasmann (pp. 331–333); (33) The Evolution of Social Life Among Caterpillars, by F. Balfour-Browne (pp. 334–340); (34) On the Knowledge of Egg Opening in the Insects, by R. Heymons (pp. 341–343); (35) The Necessity for More General Education in Entomology, by H. S. Fremlin (pp. 344–351); (36) The Species Question, by W. Petersen (pp. 352–360); (37) On the Position of the Diurnal Lepidopterous Genus Libythea, by K. Jordan (pp. 361–366); (38) The Causes of Peculiarly Severe Injuries by the Large Beet Beetle, *Cleonus punctiventris* Germ. in Hungary (pp. 367–376) and (39) The

Hungarian Migratory Locust Problem Formerly and Now; An Entomo-Biologic Sketch (pp. 377–388), both by J. Jablonowski; (40) On the Rearing of the Larva of a True Termitoxenia, by N. A. Kemner (pp. 389–404); (41) The Genus Crambus F. (Lepidopt.), a Contribution to Orthogenesis, by W. Petersen (pp. 405–413); (42) A New Attempt to Control the Gypsy Moth in Algeria, by D. F. M. de la Escalera (pp. 414–416); (43) On the Comparative Anatomy of the Insect Brain, by R. Brun (pp. 417–432); (44) Protective Resemblance Borne by Certain African Insects to the Blackened Areas Caused by Grass Fires, by E. B. Poulton (pp. 433–451); (45) The Sexual and Parthenogenetic Generations in the Life-Cycle of *Aphis rumicis* L., by J. Davidson (pp. 452–457); (46) New or Little-Known Insects, by R. P. Longinos Navás (pp. 458–461; (47) A Study in the Morphology and Biology of *Psylla mali* Schmidb., by S. Minkiewicz (pp. 462–466); (48) On the Homology of the Male Genitalia in the Lycaenidae and Their Importance in Classification, by L. J. Toxopeus (pp. 467–477); (49) An Investigation into the Defences of Butterflies of the Genus Charaxes, by C. F. M. Swynnerton (pp. 478–506); (50) Breeding Experiments on *Charaxes etheocles* at Jinja, Uganda, by Dr. Robert van Someren, and on Other Di- or Polymorphic Butterflies at Nairobi, Kenya Colony, by Dr. V. G. L. van Someren, by E. B. Poulton (pp. 507–517); (51) Mimicry in African Butterflies of the Genus Charaxes, with a Classification of the Species, by E. B. Poulton (pp. 518–575); (52) The Mallophaga and Anoplura and Their Host-Relations, by J. Waterston (p. 576); (53) On Some Methods of Research in Forest Entomology, by I. Trägårdh (pp. 577–592); and (54) On Xenopsylla and Allied Genera of Siphonaptera, by K. Jordan (pp. 593–627).

The following additional papers are briefly noted, with discussion: The Color Pattern of Mimetic Butterflies, by J. F. van Bemmelen (pp. 628–630); Some Outstanding Questions in Medical Entomology, by R. T. Leiper (pp. 631–633); On the Larva of *Micropteryx calthella*, by C. Börner (pp. 634, 635); Embryological Studies of the Strepsiptera, by J. Noskiewicz (pp. 636, 637); The Oxwarble Fly (Hypoderma) Question, by R. S. MacDougall (pp. 638, 639); On the Douglas Fir Chermes, *Gilletteа cooleyi* Gill., by J. Munro (pp. 640, 641); and On the Development of *Banchus femoralis* Thoms., by B. Biedowski and F. K. Krainska (pp. 642, 643).

From an egg to an insect, R. E. SNODGRASS (*Smithsn. Inst. Ann. Rpt. 1925, pp. 373–414, figs. 29*).—A contribution from the U. S. D. A. Bureau of Entomology on insect embryology.

Concerning phoresy in insects, L. O. HOWARD (*Ent. News, 38 (1927), No. 5, pp. 145–147*).—This is a brief summary of knowledge of the carriage of small insects by larger insects without the actual feeding of the smaller upon the larger in the adult stage.

Mutilation of twigs and canes due to the deposition of eggs by three common insects, R. H. PETTIT (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 157–160, figs. 5*).—Brief descriptions are given of the fresh mutilations or scars produced in the process of oviposition by the tree cricket, buffalo treehopper, and an allied treehopper, *Stictocephalus inermis*.

[Report of the] department of entomology, W. E. HINDS and H. SPENCER (*Louisiana Stas. Rpt. 1926, pp. 92–104*).—The principal part of this report relates to work conducted with the sugar cane borer, which is estimated by competent authorities to have destroyed 83 per cent of the 1925 crop. It was found that the burning off of trash did not destroy nearly all of the larvae in the tops, and it is concluded that the practice of burning the trash does not in itself have any great importance in the problem of borer control, although its effect upon the hibernation of the egg parasite, *Trichogramma minutum*, requires further investigation. Observations showed that the major part of the

borers for both first and second generations are produced in corn, if corn is available. It was found that over 90 per cent of the sugar cane borers in a field of corn can be removed by cutting out usually not more than 15 to 20 per cent of the cornstalks. It is considered probable that the deliberate planting of trap plats or rows of corn may prove to be an advisable and effective plantation practice of reducing the subsequent borer attack upon cane. The use of trap lights in which incandescent lanterns were used has proved that many moths may be captured in this way.

A study made of the egg parasite *T. minutum*, the principal natural enemy of the cane borer, resulted in the discovery that 77 per cent of the eggs of the tomato sphinx moth (*Deilephila lineata*) were parasitized by it, with an average of over 20 parasites per egg. However, not a single parasitized borer egg was found on either corn or cane until August 11, after which time the parasitism of borer eggs increased rapidly. Numerous observations are said to indicate that the applications of sodium fluosilicate, as made for borer control, do not affect the parasites or prevent their emergence later from these parasitized eggs. Life history studies during the year showed that five generations developed, the larvae of the fifth entering hibernation.

In insecticidal control work with both corn and cane, sodium fluosilicate was the principal poison used, as previously noted (E. S. R., 57, p. 281). It was found that the toxicity of these materials to the cane borer, and in general to corn and cane foliage as well, is in direct proportion to the percentage of the total fluorine content that is water soluble. In the course of this work the severe Gulf storm occurred on August 25, and most of the adults then active, most of the eggs, and the larvae of the first and second generations were destroyed. The larvae and pupae in the bases of the stalks were not affected. In the airplane dusting work, 26 distinct tests were conducted covering practically 1,800 acres of cane and using about 10 tons of dust. Most of the applications were made at the rate of from 15 to 20 lbs. of dust per acre. Under what may be considered "standard conditions," it appeared that the application destroyed more than 40 per cent of all sizes of borer larvae within from five to eight days, and there is evidence of a continuing toxic effect for more than two weeks. The dusting work led to the conclusion that even a single application of sodium fluosilicate applied properly and at a time when the borer infestation may justify it is quite certain to result in a substantial reduction of subsequent infestation and a very plain saving in the cane crop.

Reference is made to studies under way on the small snail *Zonitoides arboreus* Say, which feeds on sugar cane roots and promotes the spread of fungus diseases as reported by Rands (E. S. R., 55, p. 149).

In reporting upon boll weevil control work, it is stated that of 18,295 weevils placed in a number of hibernation cages at the station in the fall of 1925, 5.87 per cent emerged, the crest of emergence occurring after the middle of May.

[Entomological investigations at the Oklahoma Station], C. E. Sanborn, W. J. Brown, and G. A. Bieberdorf (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 38–43*).—This is a brief account of the status of insect pests and work conducted during the year. In experimental work with different strains of bees, the three-banded Italian was found to be the best for the State as a whole, since in addition to being a good honey gatherer it is more resistant to injurious insects and diseases than other varieties. Reference is made to the use of the airplane in attempted matings at high altitudes, which is considered to warrant further work.

A 2 or 3 per cent mixture of nicotine sulfate with lime used as a dust is said to give satisfactory control of the cowpea, cotton, or melon aphid. Calcium cyanide was tested but did not give as satisfactory results as the nicotine sulfate dust. With the increased growth of kafir and broomcorn in the State the corn leaf louse has become of greater importance as a pest than the chinch bug or any other insect. The yield of darso is often reduced by it as much as 15 per cent, and there are instances of its reduction to the extent of 50 per cent.

Referring to the green bug, it is pointed out that the life history, until recently unknown, is passed during the summer especially on Johnson grass and also on crab and similar grasses which may remain succulent and somewhat shaded from the direct heat of the sun. The application of nicotine dust is said to be the most practical method of control during the fall or early spring in wheat or similar fields. About 2 pints of nicotine sulfate and 50 lbs. of hydrated lime are thoroughly mixed and dusted on infested fields in sufficient quantity to give the fields a color tinge of white. Another means which it is thought may be quite effective and perhaps more economical is that of burning or singeing the insects or plants before the latter have reached the jointing stage. An oil burning device similar to a blow torch or prickly pear burner arranged in batteries so as to cover a large space at one time appears to be sufficient for controlling the insect without doing severe damage to the plants.

Reference is made to work with the boll weevil, a bulletin relating to which has been noted (E. S. R., 55, p. 158). The cotton flea hopper caused its first injury in the State during the summer of 1926. Many fields, especially the most productive areas along river valleys, were damaged to such an extent as to produce an exceedingly large vegetative growth with little or no fruit.

Projects of investigations of insects affecting truck crops in Louisiana, 1926, C. E. SMITH and N. ALLEN (*Louisiana Stas. Rpt. 1926, pp. 120–122*).—Brief reference is made to cooperative studies of the spotted cucumber beetle and the tomato fruit worm. Observations of the spotted cucumber beetle indicate that there is but one major brood produced during the year in Louisiana, the greatest amount of damage being caused by the adults present in the field during the winter and early spring and by the larvae present in the early spring. Sodium fluosilicate gave favorable results in the control of the species. In control work with the tomato fruit worm, moderately satisfactory results were obtained from the use of arsenicals, while sodium fluosilicate gave unsatisfactory results due to ineffective controls obtained with the weaker dilutions and the severe injury to foliage and fruit by the stronger strengths. A high percentage of the worms in the field in the fall of 1926 were killed by an Entomophthora fungus.

Prairie insects, W. P. HAYES (*Ecology, 8 (1927), No. 2, pp. 238–250, figs. 2*).—In this paper the author indicates some of the general factors operating on the prairie, with special consideration of the region in the vicinity of Riley County, Kans. Attention is also directed to some physiological and morphological adaptations for prairie existence probably produced by these factors.

Economic insects in some streams of northern Utah, J. G. NEEDHAM and R. O. CHRISTENSON (*Utah Sta. Bul. 201 (1927), pp. 36, figs. 44*).—This is a report of work conducted with a view to determining the places best adapted for the planting of young fish and the adequacy of fish food in the streams. Following an introduction, the authors consider plant life of the streams; the animals; the aquatic insects, including may flies, stone flies, dragon flies, caddis flies, and two-winged flies and midges; where the insects of the river live and how to find them; and associations; and give some general observations.

The relationship between the chemical constitution of organic compounds and their toxicity to insects, F. TATTERSFIELD (*Jour. Agr. Sci. [Eng-*

nd], 17 (1927), No. 2, pp. 181–208, figs. 3).—In this paper an analysis is made the relationships between chemical constitution and insecticidal action in e vapor phase, and an account is given of the toxicity to insects of certain ant products.

The groups of organic chemicals tested for their toxic action on *Aphis rumicis* nd the eggs of *Selenia tetralunaria* are listed. Three to five dinitro-o-cresol shown to have a most powerful ovicidal effect. An examination was made f the toxicity of the fatty acids, and it is shown that as the series is ascended oxicity increases up to undecylic acid, after which it declines. An analysis s made of the bearing of certain of the physical properties of these acids upon oxicity; such are volatility, physical state, partition coefficients, dissociation onstants, and surface tensions of their solutions in water. None of these properties entirely accounts for the toxicities shown by the fatty acids, but to a certain extent with some of them correlation is sufficiently close to indicate the necessity of further study but on simplified lines.

Tests of a commercial liquid insecticide composed of a petroleum and pyrethrum powder base [trans. title], S. ABBATUCCI and E. ROUBAUD (*Bul. Soc. Path. Exot., 19 (1926), No. 10, pp. 901–903*).—Notes are given on the effect of Fly-tox on a number of common insects.

Relation of size of oil drops to toxicity of petroleum-oil emulsions to aphids, E. L. GRIFFIN, C. H. RICHARDSON, and R. C. BURDETTE (*Jour. Agr. Research [U. S.], 34 (1927), No. 8, pp. 727–738, figs. 2*).—This is a report of investigations conducted by the U. S. D. A. Bureaus of Chemistry and Entomology, cooperating.

Petroleum-oil emulsions were prepared (1) while hot, under pressure, (2) by a cold-stir method, and (3) by grinding in a colloid mill, to give a series of preparations, with or without emulsifiers, in some of which the oil droplets were large (7 to 12 μ in diameter) and in others small (2 to 4 μ or less in diameter). It was found that the emulsions in which the oil droplets were relatively large were decidedly more toxic to *Aphis rumicis* than those in which the droplets were small. The toxicity of the preparations, as correlated with drop size, was not influenced by the physical characteristics of the oil, the presence or absence of a soap emulsifier, or the presence or absence of cresol. When foliage or twigs of plants without foliage were sprayed with emulsions of large drop size more oil was retained by the plant surface than when the foliage or twigs were sprayed with emulsions of small drop size. The following explanation for this is offered by the authors:

"Oil droplets in emulsions and plant surfaces bear negative electrical charges. The droplets in an emulsion of small drop size have a greater charge per unit volume of oil than those in an emulsion of large drop size because the charge is proportional to the surface. It is believed that plant surfaces repel the droplets in the first type of emulsion with a greater force than they repel the droplets in the emulsions of large drop size, and that consequently the electric charges of plant surfaces and oil droplets are a factor in determining the ability of the oil in an emulsion to adhere to plant surfaces. Under conditions of comparable concentration and type of oil, miscible oils are probably less toxic to insects than the ordinary soap-oil emulsions, because they contain smaller oil droplets and the oil therefore adheres to the plant (and no doubt to the insect) less effectively."

Studies on contact insecticides.—Part V, The toxicity of the amines and N-heterocyclic compounds to Aphis rumicis L., F. TATTERSFIELD and C. T. GIMINGHAM (*Ann. Appl. Biol., 14 (1927), No. 2, pp. 217–239, figs. 6*).—In this account of further studies (E. S. R., 56, p. 358) the authors report that the toxicities to *A. rumicis* of certain aliphatic and aromatic amines and of some

of the simpler nitrogen-heterocyclic derivatives have been quantitatively determined.

Tetramethylammonium hydrate and chloride are more toxic than the corresponding tetraethylammonium compounds. This is in keeping with the findings of Dale and his coworkers, who have shown that tetramethylammonium has certain physiological effects similar to those of nicotine which are not shown by tetraethylammonium. The aromatic amines, on the whole, show little insecticidal action. Aniline and most of the aliphatic anilines are only slightly toxic to *A. rumicis*. The substitution of aromatic groups in the amino group of aniline increases toxicity more than the substitution of aliphatic groups.

As to relationships in regard to toxicity among these compounds, the following orders of toxicity were noted:

Phenylamine (aniline) < diphenylamine > triphenylamine
Phenylamine (aniline) < benzylaniline > dibenzylaniline
Benzylamine < dibenzylamine > tribenzylamine

o-Nitraniline is one of the most toxic of the aniline derivatives. α-Naphthylamine is more toxic than aniline. Substitution of various radicals in the amino group of aniline has a greater effect on the toxicity of the resulting compound than substitution of the same radicals in α-naphthylamine. α-Naphthylamine derivatives are more toxic than the corresponding β-derivatives. Among the heterocyclic compounds, nicotine is highly poisonous to *A. rumicis*. The heterocyclic rings constituting the molecule of nicotine are much less toxic than nicotine itself; pyrrole and pyridine show comparatively slight insecticidal action. The order of toxicity of the simpler N-heterocyclic compounds runs: Pyrrole < pyridine < picoline < lutidine < quinoline and isoquinoline < acridine. Hydrogenation of pyridine and pyrrole increases their toxcity; piperidine is more toxic than pyridine and pyrrolidine than pyrrole. Benzyl-pyridine is the most toxic pyridine derivative tested.

Poison baits for grasshoppers and cut-worms, R. H. PETTIT (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 144–147*).—A brief account is given of the poison baits to be used in controlling grasshoppers and cutworms, with directions for their preparation and distribution.

The beet leafhopper and curly-top situation in Utah, G. F. KNOWLTON (*Utah Sta. Circ. 65 (1927), pp. 12, figs. 7*).—This is a practical summary of information on this insect-transmitted disease of the sugar beet. The data are presented under the heads of distribution, economic importance, transmission of the disease, symptoms, overwintering of the virus, life history of the leafhopper, and control.

The oviposition rate of the grape leaf hoppers, C. I. BLISS (*Jour. Agr. Research* [U. S.], *34 (1927), No. 9, pp. 847–852, fig. 1*).—This is a report of observations made at Sandusky, Ohio, of the productivity of grape leafhoppers, in which the daily rate of oviposition by overwintering females was recorded. Of the five forms studied, *Erythroneura tricincta cymbium*, *E. comes comes*, and *E. comes compta* showed much greater productivity on *Vitis labrusca* stocks than on vines predominantly *V. vulpina*. *E. vitis* and *E. vitifex*, on the other hand, were more productive on *vulpina* stocks. Both of these conditions agree with the distribution of the respective species in the field.

Of the environmental factors, temperature was found to condition oviposition more by its indirect effect upon egg development than by direct action on egg deposition. The effect of density of population was slight.

An undescribed white fly attacking citrus in Porto Rico, H. L. DOZIER (*Jour. Agr. Research* [U. S.], *34 (1927), No. 9, pp. 853–855, figs. 3*).—Under the name *Paraleyrodes naranjae* the author describes a new species of white

fly from Porto Rico, which, although not at present of economic importance, is of potential importance to other citrus-growing countries. The species is found to be very highly parasitized, 30 of 49 pupa cases mounted on slides having shown evidence of parasitism. A single female parasite, *Encarsia variegata* How., was reared in January, this species having been described by Howard (E. S. R., 21, p. 452) as a parasite of *P. perseae* in Florida.

The tobacco budworm and its control in the Georgia and Florida tobacco-growing region, A. C. Morgan and F. S. Chamberlin (*U. S. Dept. Agr., Farmers' Bul. 1531 (1927), pp. II+10, figs. 10*).—This supersedes Farmers' Bulletin 819, previously noted (E. S. R., 37, p. 663).

Description of a new cotton-infesting species of Bucculatrix (Lepidoptera), A. W. Morrill (*Ent. Soc. Wash. Proc., 29 (1927), No. 4, pp. 94–97, figs. 2*).—Under the name of *B. gossypiella* n. sp. the author describes a new lepidopteran which attacks American Upland, Egyptian, and several Mexican wild species of cotton in the vicinity of Cajeme, Sonora, Mexico.

An experimental investigation of the relations of the codling moth to weather and climate, V. E. Shelford (*Ill. Nat. Hist. Survey Bul. 16 (1927), Art. 5, pp. 307–440, figs. 34*).—The paper here presented is divided into three parts, namely, prediction procedure (pp. 315–327), a basis for the measurement of development (pp. 328–356), and methods of experimentation and calculation (pp. 357–436). A bibliography of 4 pages is included.

A study of the catalase content of codling moth larvae, C. S. Spooner (*Ill. Nat. Hist. Survey Bul. 16 (1927), Art. 6, pp. 441–446*).—The author concludes that the codling moth larvae contain large quantities of the enzyme catalase, the quantity per unit of larval weight varying considerably in different individuals. The catalase content is directly correlated with the health and continued life of larvae and may be directly correlated with pupation and dormancy.

Studies in the ecology of Montana cutworms (Phalaenidae), W. C. Cook (*Ecology, 8 (1927), No. 2, pp. 158–173, figs. 2*).—The account here reported deals with the general geographic and seasonal relations of the phalaenid moths and their local distribution as affected by cultivation on a typical dry-land area near Three Forks, Mont.

The black army cutworm: A blueberry pest, C. R. Phipps (*Maine Sta. Bul. 340 (1927), pp. 199–216, pls. 2*).—This is an account of *Agrotis fennica* Tausch., including its history and distribution in North America, importance in Maine, technical description, recognition, food plants, life history, habits, type of injury produced, and methods of control. Originally described from Russia in 1806, it was first reported from North America in 1874 and occurs in Canada and some of the Northern States. It feeds upon a great variety of plants, but was not recorded as a blueberry pest until the spring of 1925, in which year it caused tremendous damage to that crop in Maine. The season of 1926 was much later than the preceding season and relatively few of these cutworms appeared. The first injury to this crop takes place during warm nights in late April or early May, when the cutworms eat out all or part of the inside of the bud and leave the empty bud scales. Later the bud scales turn brown and wither, giving them the appearance of having been injured by early frosts. During the seasons of normal infestation there is usually enough food in or near the berry fields so that even if the fruit buds have been destroyed the later feeding on the leaves is not very noticeable.

A survey made during the summer of 1925 revealed the fact that the damage was distributed throughout the entire blueberry-producing section in five counties of the State, growers suffering individual losses varying from $500 to $2,500, one grower reporting a loss of over $8,000. It was estimated that

the loss in Hancock County alone amounted to $100,000. Other crops were attacked also, especially garden plants and nursery trees, a nursery of 1,000 seedling apple trees near Monmouth having been seriously injured. The list of food plants compiled includes 40 different species representing members of 20 families.

The caterpillars appear to pass the winter as small larvae, the first pupae in 1926 having been obtained in Cumberland County on June 1 and in Hancock County June 21. The longest period in the pupal stage was 24 days, the shortest 16 days, the average being 21.3 days. The first moths reared in Cumberland County emerged on June 16 and in Hancock County July 13. Oviposition has not as yet been observed. The eggs are usually deposited on various weeds, grasses, or shrubs.

It is concluded that the most effective control either in small gardens or large fields may be obtained by the use of poison baits, one, consisting of bran 20 lbs., Paris green or finely powdered white arsenic 1 lb., molasses 2 qt., and water about 3 gal., having proved satisfactory.

Three new hymenopterous parasites of the pine tip moth, Rhyacionia frustrana (Comstock), R. A. CUSHMAN (*Jour. Agr. Research* [U. S.], *34* (*1927*), *No. 8, pp. 739–741*).—The species here described are *Campoplex frustranae* n. sp., from Falls Church, Va.; *Phanerotoma rhyacioniae* n. sp., from Bogalusa, La.; and *Microbracon gemmaecola* n. sp., from Nantucket, Mass.

An experiment with Paris green as an Anopheles ludlowi larvicide, J. W. SCHARFF (*Malayan Med. Jour.*, *1* (*1926*), *No. 4, p. 14; abs. in Rev. Appl. Ent.*, *15* (*1927*), *Ser. B, No. 4, p. 61*).—This is a report of an experiment conducted in which Paris green and oil were poured on two tidal pools, the edges of both of which were covered with weeds with a mass of algae in the center. A half pint of oil mixture, consisting of 50 parts of Solar oil, 5 parts of kerosene, and 10 parts of crude oil, was mixed with sawdust and scattered carefully over a pool of 20 sq. ft. Paris green (56.5 per cent arsenic) was mixed with 100 parts by volume of dry sawdust and scattered over a second pool of the same size. The results lead the author to conclude that Paris green (1:100) can be used effectively at a cost considerably below that of oiling, although the minimum lethal dose was not established; that this mixture is much lighter and easier to apply than oil; and that it gives no indication of its presence other than a little sawdust residue. It is pointed out that both mixtures rapidly lose their toxic powers.

Compendium of the parasites of mosquitoes (Culicidae), A. J. SPEER (*U. S. Pub. Health Serv., Hyg. Lab. Bul. 146* (*1927*), *pp. IV+36*).—This is a catalogue of the parasites of mosquitoes.

A technique for artificial feeding of sandflies* (Phlebotomus) *and mosquitoes, A. T. and M. HERTIG (*Science*, *65* (*1927*), *No. 1683, pp. 328, 329*).—The authors describe a technique which was devised for feeding rich suspensions of *Leishmania* to sand flies.

An interesting sand fly outbreak in Texas, F. C. BISHOPP (*Jour. Parasitol.*, *13* (*1927*), *No. 3, p. 217*).—The author records *Culicoides variipennis* as a serious pest of man and livestock in the vicinity of the salty streams in central Texas, were it now breeds in great numbers. The species is said to breed normally in salt water along the coast.

Report of the departmental committee on warble fly pest, S. STOCKMAN ET AL. (*London: Min. Agr. and Fisheries, 1926, pp. 48; rev. in Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1926*), *No. 9, pp. 785–788; Vet. Rec.*, *7* (*1927*), *No. 3, pp. 66, 67*).—This is a report by the committee of ten appointed by the Minister of Agriculture and Fisheries of Great Britain to consider and recommend ways and means of exterminating the warble fly. An account of the experiments conducted is

prefaced by a review of the life history and habits of the pest. As regards the manner of infestation, it is pointed out that it takes place through the skin and not through the mouth as once supposed, and the experiments have shown that under natural conditions the eggs are dislodged or destroyed by the animals in licking their skin.

The experiments were designed to show (1) methods of preventing the fly from laying its eggs on cattle, and (2) the effects of drugs, dressings, and other means for destroying the larvae in the body of the host. They show that some protection is afforded by the application of certain substances during the summer season, of which a proprietary warble fly lotion gave the best results, although reduction in the warble maggots in the treated animals did not in any case exceed 50 per cent. The injection of drugs into the host with a view to destroying the maggot during its early migrating stages gave negative results. Destruction of the maggots during the months of February to June, either by squeezing out the larvae through the breathing holes as they become evident or by application of a destructive dressing by means of a syringe, cloth, or sponge, is considered the most effective means. In concluding, it is pointed out that total extermination of the warble fly is a harder undertaking than is generally supposed, although a few years of constant destruction over any considerable area will do much to reduce the warble population to the verge of extermination provided the sources of introduction are closed.

The cabbage flea-beetle and its control in British Columbia, R. Glendenning (*Canada Dept. Agr. Pamphlet 80, n. ser.* (*1927*), *pp. 10, figs. 6*).—This is an account of the flea beetle causing the most damage in the Lower Fraser Valley, British Columbia, and means for its control.

The striped cucumber beetle, H. H. Jewett (*Kentucky Sta. Circ. 37* (*1927*), *pp. 19–34, figs. 5*).—This is a brief summary of information on this pest and means for its control. In the tests made in 1926 two dust insecticides gave excellent control. Lead arsenate 1 lb. and land plaster 10 lbs. gave somewhat higher yields than calcium arsenate 1 lb. and land plaster 20 lbs. They should be used at the rate of 20 to 70 lbs. per acre according to the size of the vines.

Olfactory response of the Japanese beetle (Popillia japonica Newm.), E. A. Richmond (*Ent. Soc. Wash. Proc., 29* (*1927*), *No. 2, pp. 36–44*).—This contribution from the Japanese Beetle Laboratory, Riverton, N. J., on work from 1922 to 1926 shows that while geraniol is the primary attrahent of the Japanese beetle its combination with eugenol lowers the cost and increases its effectiveness. Eugenol, citral, citronellol, and citronellal follow geraniol as attractive agents. The addition of geraniol, 1:1,000, to the usual arsenate of lead spray proved exceedingly efficacious in attracting the beetles, but the main difficulty seemed to be that the odor dissipated too rapidly. The value of geraniol when used in connection with a contact spray has been demonstrated. No entirely satisfactory poison bait has been discovered, although lead chloride, sodium arsenite, sodium arsenate, and Paris green produced a fairly high kill.

The Mexican bean beetle, H. H. Jewett (*Kentucky Sta. Circ. 36* (*1927*), *pp. 18, figs. 7*).—This is a practical summary of information on the biology of this pest, and includes a brief report on the results of control experiments conducted in 1925 and 1926. The experiments show that the fluosilicate dusts, both sodium and calcium, give less satisfactory control than do the arsenical mixtures. In 1925 calcium arsenate 1 lb. and hydrated lime 9 lbs. gave slightly better control than any of the other insecticides used. In 1926 the lead arsenate dust and spray gave as good control as any of the insecticides, but there was decided foliage injury in at least two tests. Zinc arsenite did not injure bean foliage, and yields were good. The dust made of calcium arsenate 1 lb. and hydrated lime 9 lbs. and the spray made of calcium arsenate 0.75 lb. and lime

1.5 lbs. in 50 gal. gave in general slightly better protection than the other insecticides that were used.

The control of the alfalfa weevil, G. I. REEVES (*U. S. Dept. Agr., Farmers' Bul. 1528 (1927), pp. II+22, figs. 15*).—This supersedes Farmers' Bulletins 741 and 1185, previously noted (E. S. R., 35, p. 554; 44, p. 855).

A note on the life-history of Cryptorhynchus mangiferae Fab., C. K. SUBRAMANYAM (*Madras Agr. Dept. Yearbook 1925, pp. 29–36, pl. 1*).—This is a brief report of a study of the life history of the mango seed weevil.

Biology of the Hymenoptera, H. BISCHOFF (*Biologie der Hymenopteren. Berlin: Julius Springer, 1927, pp. VII+598, figs. 224*).—The several chapters of this work deal respectively with the general anatomy of the Hymenoptera, classification, phylogeny, distribution, and variability; activity and rest; nutrition; respiration and circulation; nervous system and senses; nests of the solitary aculeate Hymenoptera; nests of the social Hymenoptera; eggs and oviposition; brood and brooding; parasitism; social life; sexual life; development; special adaptations, diseases, and economic importance. A bibliography of 12 pages and generic and subject indexes are included.

The ant people, H. H. EWERS, trans. by C. H. LEVY (*New York: Dodd, Mead & Co., 1927, pp. X+323, pls. 16, figs. 16*).—A popular account.

A revision of the parasitic wasps of the subfamily Braconinae occurring in America north of Mexico, C. F. W. MUESEBECK (*U. S. Natl. Mus. Proc., 69 (1927), Art. 16, pp. 73, pls. 2, fig. 1*).—A synopsis of this subfamily of parasites, including a key to the Nearctic genera of the subfamily and keys for the separation of the species. Descriptions of 17 new forms are included.

Eurytoma parva (Girault) Phillips and its biology as a parasite of the wheat jointworm, Harmolita tritici (Fitch), W. J. PHILLIPS (*Jour. Agr. Research [U. S.], 34 (1927), No. 8, pp. 743–758, figs. 2*).—This is an extended account of studies of the history and biology of *E. parva*, which at present appears to be one of the most important parasites of the wheat jointworm. It is recorded as both parasitic and phytophagous in habit, this being the first detailed observation made of this relationship for American Chalcidoidea. In one instance a larva of the second instar of *E. parva* that had evidently consumed a larva of *H. tritici* and had begun to feed on plant sap was reared to maturity upon a fullgrown larva of *H. tritici*. The studies indicate that *E. parva* is gradually changing from a parasitic to a phytophagous habit.

Legumes for Texas beekeepers, H. B. PARKS (*Texas Sta. Circ. 46 (1927), pp. 12, figs. 2*).—This is a practical account in which information is given on the legumes of most value to the beekeeper in Texas. Those recommended for trial include crimson clover, white sweet clover, yellow sweet clover, and Hubam clover.

United States standards for honey recommended by the United States Department of Agriculture (*U. S. Dept. Agr., Dept. Circ. 410 (1927), pp. 32, fig. 1*).—This circular has been prepared by E. L. Sechrist, of the Bureau of Entomology in consultation with other specialists of the Bureaus of Entomology and Agricultural Economics. It includes information given in Circular 364 (E. S. R., 54, p. 206) and other data as to grading and packing honey.

ANIMAL PRODUCTION

Net-energy values of corn silage, soy-bean hay, alfalfa hay, and oats, E. B. FORBES, W. W. BRAMAN, M. KRISS, ET AL. (*Jour. Agr. Research [U. S.], 34 (1927), No. 8, pp. 785–796*).—Three Aberdeen Angus steers weighing about 800 lbs. each and varying in age from 32 to 28 months at the beginning of the experiment were fed at the Pennsylvania Experiment Station to determine the

net energy of certain feeds. Previous to the tests the animals had been running on pasture and were in good flesh. During 4 periods of the test the animals received no feed, and during the remaining 10 periods were fed corn silage, soy bean hay, or alfalfa hay, either alone or with a grain supplement. The preliminary feeding for each experimental period was never less than 10 days; the digestion periods, normally 18 days, had sometimes to be shortened; the calorimeter periods were all of 3 days duration, and the fasting calorimeter periods were 3 days in one test and 4 days in the other three. Some difficulties were experienced in getting the animals to eat the coarser portions of some of the feeds, and this necessitated compromises in the length of the periods. The steers were prepared for the fasting tests by withholding roughage for a day, grain for the latter half of that day, and then administering two doses of physic. The measurement of heat production was started the following morning.

The net energy values per kilogram of dry matter of feeds for maintaining the steers used were as follows: Corn silage 2,098 Calories, soy bean hay 1,502 and 1,689 Calories, alfalfa hay 1,272 and 1,327 Calories, and ground oats 2,224 and 2,476 Calories. These values were determined by direct calorimetry, using the heat production during fast as the measure of maintenance requirement of net energy. In this work it was found that the net energy of the feed is more significant and consistent as a measure of the energy value of the feed than is the metabolizable energy.

The fasting tests showed that the maintenance requirement of net energy of the steers used were 1,470, 1,517, and 1,537 Calories, respectively, per square meter of body surface, and 1,818, 1,896, and 1,896 Calories, respectively, per 100 kg. of live weight.

Chemical and nutritive properties of the mung bean, V. G. Heller and N. B. Guerrant (*Oklahoma Sta. Bien. Rpt. 1925–26, p. 14*).—Mung beans made up 60 per cent of a ration for rats, in which it constituted the sole source of protein. Normal growth continued up to maturity, and the females produced normal young. The failure of these young to grow normally was comparable to rats fed on single cereals. A chemical analysis of mung beans showed that the quantity and quality of the protein is excellent. Vitamins A, B, and D are also present in amounts sufficient for normal functioning of animals.

Comparison of roughages supplemented with cottonseed meal as a concentrate, W. L. Blizzard (*Oklahoma Sta. Bien. Rpt. 1925–26, p. 32*).—Four lots of steers were selected to compare various rations. Lot 1 received shelled corn, cottonseed meal, alfalfa hay, and darso silage; lot 2 cottonseed hulls and cottonseed meal; lot 3 cottonseed meal and darso silage; and lot 4 cottonseed meal and kafir hay. The average daily gains were 3.07, 1.67, 2.6, and 1.18 lbs., respectively.

[Experiments with beef cattle at the Nebraska Station] (*Nebraska Sta. Rpt. [1926], pp. 18–20*).—Studies with beef cattle have been continued from previous reports (E. S. R., 55, p. 664).

Feeding rations for cattle.—Three lots of fleshy 3-year-old steers and one lot of heifers were fed for 75 days. Lots 1 and 2 received shelled corn and alfalfa hay, and in addition lot 2 was fed 10 per cent linseed meal. Lots 3 and 4 were fed ground ear corn and alfalfa hay. The steers averaged 3 lbs. and the heifers 2.71 lbs. daily gain per head. While the steers in lot 2 made slightly greater gains and sold for 10 per cent higher than those in lot 1, the feeding of linseed meal was not found profitable. The yearling heifers required 191 lbs. less corn and 62 lbs. less alfalfa hay to produce 100 lbs. gain than the steers in lot 3.

Factors affecting the quality of meat.—Fifteen heifer calves weighing approximately 392 lbs. were used in this experiment. Three were killed at the beginning of the test, and at intervals of 25 days 3 more were killed. Detailed records were kept of dressing percentage, weight of organs, amonnt of internal fat, and cutting yields, and in addition the carcasses were graded. As feeding progressed the dressing percentage increased from 58.9 to 60.93. The percentage weight of organs remained practically constant as the animals increased in weight. Little difference was noted in the percentage of the various cuts. The amount of kidney and pelvis fat increased, and the percentage of internal fat almost doubled. In the opinion of the judges, the best carcasses were yielded by heifers fed from 100 to 125 days.

Preliminary report on the supplemental feeding of range cattle in New Mexico, J. L. LANTOW (*New Mexico Sta. Bul. 161 (1927), pp. 13, figs. 2*).—This is a preliminary report of work that is to be carried on for several years. The object is to determine the effects of different amounts of supplementary feeding (1) when forage is more than sufficient for maintenance and (2) when forage is insufficient for maintenance. Points to be studied consist of the effect on gains when feeding is discontinued, on the percentage of calf crop, and on the weight of calves at birth and at different ages.

Five lots of 10 heifer calves each were used and also carried through as yearlings. As calves, lot 1 received 0.5 lb. of cottonseed cake and lots 2, 3, 4, and 5 received 1, 1.5, 2, and 0 lbs. of cake, respectively. As yearlings, this amount was raised to 1, 2, 3, 4, and 0 lbs. of cake, respectively. The calves were fed from late in November to the middle of May, and the yearlings from the last of December to the last of April. All cattle ran on the same range.

With calves the 0.5 lb. of cottonseed cake proved more efficient than larger amounts when the range was above maintenance. One lb. of cake was most efficient for the yearlings. The lots that made the most gain during the winter made the least gain on pasture.

A comparison of the direct measurement of the heat production of cattle with the computation of the heat production by the respiratory-quotient method, E. B. FORBES, M. KRISS, W. W. BRAMAN, and R. B. FRENCH (*Jour. Agr. Research [U. S.], 34 (1927), No. 9, pp. 865–878*).—This test was undertaken to confirm the method of computing the heat production of animals by the respiratory-quotient method as applied to cattle. Comparisons were also made of these computed values with direct measurements of heat production by means of the respiration calorimeter. The carbon dioxide and oxygen of the incoming and outgoing air, the outcoming combustible gases, and the nitrogen of the urine were measured for heat production in the calorimeter. The effect of the position of the animal as to standing and lying was also taken into consideration. Certain improvements, such as a continuous and accurate representative sample of the outcoming air, the number of oxygen determinations, made with one solution, and the method of accounting for the urinary outgo during fast, are needed to perfect this method.

In spite of these imperfections, in 18 comparisons with the direct method all the computed values were between 98 and 104.8 per cent of the directly observed values. Samples of the outcoming air from the respiration chamber showed a variability affected by (1) the position of the animal, (2) the activity of the animal, (3) the time elapsed since change of position, and (4) the time elapsed since feeding. For these reasons no short time observation can be assumed accurately to represent the whole day. The products of the extensive fermentation of carbohydrates constitute an important factor in this variation.

[**Sheep work at the Belle Fourche (S. Dak.) Field Station**], B. AUNE (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 25–27, 29, 30*).—The results of several years experiments with sheep, some of which are continuations of previous work (E. S. R., 53, p. 370), are briefly noted.

Pasturing alfalfa, corn, and beet tops with sheep.—Continuing this work, the average daily gain for the 10-year period was found to be 0.39 lb. per lamb. With an average yield of 4 tons of alfalfa per acre, the carrying capacity was 8 ewes from May 20 to October 1 and 12 lambs from May 20 to August 1.

The average yield of corn for 10 years was 49.1 bu. per acre. The corn was pastured at the rate of 37 lambs per acre, and the average pasturing period was 52 days. The average daily gain per lamb was 0.32 lb., and it required on the average 4.8 lbs. of corn to produce 1 lb. of gain. In addition to the corn the lambs had access to 1 acre of beet tops and alfalfa, or alfalfa hay in racks.

Pasturing sheep.—Two years' work has been completed with a farm flock consisting of purebred Hampshire and range ewes. All ewes were bred to purebred Hampshire rams. The ewes were fed hay during the winter and grain from just before lambing up to the time they went on pasture. At the time the flock was turned on pasture the lambs averaged 33 lbs. in weight the first year and 30.8 lbs. the second year. The first year the lambs were divided and placed on alfalfa and native pasture. Those on alfalfa made an average daily gain of 0.5 lb., and those on native pasture 0.42 lb. The second year they were placed on alfalfa, sweet clover, and native pasture. The average daily gains were 0.48, 0.56, and 0.35 lb. on the respective pastures. On August 7, the first year the lambs averaged 92 lbs. in weight, and on August 6 the second year they averaged 82.4 lbs.

The purebred Hampshire ewes sheared an average of 7.33 lbs. of wool for the 2 years, the range ewes 9.96 lbs., and the yearling crossbred ewes used the second year sheared 10.64 lbs.

Correlation studies involving factors that influence the quality of the fleece in the Rambouillet sheep, A. E. DARLOW and W. A. CRAFT (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 37, 38*).—This is a preliminary report of correlation studies of wool from the following breeds: Rambouillet, Dorset, Shropshire, Oxford, Hampshire, and Southdown. The weight of the fleece was recorded at shearing time, and two samples of wool were taken from the side just behind the shoulder. One sample was used for a scouring test, and the other sample was subjected to the following tests: Diameter and length of fiber, stretch, breaking strength, and crimp per inch.

Correlation coefficients were determined for 11 Rambouillet fleeces. The correlation for diameter and length averaged 0.26±0.08. Of the 11 fleeces 7 gave a positive and 4 a negative correlation between diameter and crimp per inch. The positive group averaged +0.15 and the negative −0.14. The correlation between diameter and stretch of fiber gave greater variations, and the number of determinations made was not sufficient to explain the variation. The correlation between diameter and breaking strength averaged 0.63±0.05.

Lamb feeding [at the Nebraska Station] (*Nebraska Sta. Rpt. [1926], p. 20*).—Eight lots of 25 lambs each were fed on various combinations of shelled corn, cracked corn, linseed meal, alfalfa hay, and alfalfa molasses meal with varying percentages of cane and beet molasses. The most uniform gains were made in the lots receiving the alfalfa molasses meal, and the greatest in a lot fed cracked corn, linseed meal, and alfalfa molasses meal. The ration producing the cheapest gain was composed of shelled corn and alfalfa hay.

[**Experiments with hogs at the Nebraska Station**] (*Nebraska Sta. Rpt. [1926], pp. 20–22*).—The results of several experiments are noted, some of which are continuations of those previously recorded (E. S. R., 55, p. 669).

Comparison of pasture crops for pork production.—Nine lots of 10 pigs each were fed to compare dry lot with pasture feeding, alfalfa with Sudan grass, corn alone with corn and tankage on Sudan pasture, and the value of Dwarf Essex rape. During the 70-day feeding period the pigs on alfalfa pasture made an average gain of 1.14 lbs. daily as compared with 1.1 lbs. daily gain for those on Sudan. Corn alone and a limited feed of corn and tankage on Sudan produced slower gains, while a ration of corn, shorts, and tankage 8-4-1 produced larger gains than when corn and tankage were full fed. Pigs on Dwarf Essex rape made slightly more rapid and almost as economical gains as those on alfalfa.

Protein supplements for fattening hogs.—To compare the value of mixtures of protein supplements with a single supplement when fed with corn, 8 lots of pigs were fed for 100 days. The following supplements were used in the various lots: Tankage, cracklings (64 per cent protein), tankage 3 parts and linseed meal 1 part, equal parts of tankage and linseed meal, equal parts of tankage and cottonseed meal, equal parts corn oil cake meal and tankage, shorts and tankage self-fed free choice, and tankage and fourth cutting alfalfa. The average daily gains per head in the respective lots were 1.29, 1.18, 1.53, 1.3, 1.46, 1.25, 1.53, and 1.48 lbs.

Effect of age of sow.—Pigs raised by mature sows made an average daily gain of 1.59 lbs., while those from gilts made 1.27 lbs. There was little difference in the economy of gain, the cost per 100 lbs. being $6.93 and $7.08, respectively.

Self-feeder v. hand feeding.—Pigs on a self-feeder with corn and tankage made an average daily gain of 1.5 lbs., as compared with 1.29 lbs. for those hand fed the same ration. The feed cost per 100 lbs. gain (not including the labor of hand feeding) was $6.94 and $7.12, respectively.

Methods of preparing kafir corn for hog feeding, C. P. THOMPSON (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 32, 33*).—Continuing this experiment (E. S. R., 53, p. 171), soaking kafir corn in the head gave no better results than feeding dry. Feeding kafir in this manner reduced the feed required to produce 100 lbs. of gain and also the rate of gain. Pigs thus fed did not reach a marketable condition in an ordinary feeding period. The self-feeder was found to be the most satisfactory manner of feeding kafir either whole or ground.

[Swine work at the Belle Fourche (S. Dak.) Field Station], B. AUNE (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 27–29, 30–33*).—The results of hog feeding tests are briefly reported.

Pasturing alfalfa with hogs.—Continuing this work (E. S. R., 53, p. 371), the table has been enlarged to include the years 1923–1925.

The average pasturing periods for the two rotations, for 13 and 11 years, were 119 and 122 days, respectively. The average live weights pastured per acre were 2,123 and 2,182 lbs., and the average gains 1,890 and 1,989 lbs. The grain required per pound of gain was 2.81 and 2.70 lbs. in the respective rotations.

Pasturing corn with hogs.—Corn in the above rotations was pastured at the rate of 16 hogs per acre with pigs averaging 84 lbs. initial weight. During the 11 and 14 years of the experiment, the average estimated yield was 50 bu. per acre, the average length of the test was about 26 days, the average total live weight of hogs when turned on corn was approximately 1,350 lbs., and the total gain per acre about 686 lbs. It required approximately 4.2 lbs. of corn to produce 1 lb. of gain. The data from 1912 to 1925 are tabulated for each year.

Feeder-pig production.—Beginning in 1923 and for the two subsequent years, experiments were conducted to determine the feed required to produce 100-lb.

pigs. Sows and gilts were used for producing these pigs. During gestation the sows were hand fed a grain ration and had access to alfalfa hay. During the suckling period they were placed on self-feeders. The last two years they were on alfalfa pasture for 28 days and the pigs had access to shelled corn in creeps.

The average number of pigs raised per sow for the 3-year period was 4.5, and the average weight per pig at weaning time was 37 lbs. The average feed required to produce 100 lbs. of weight at weaning time was 682 lbs. of corn, 331 lbs. of half-sugar beets, and 265 lbs. of third-cutting alfalfa hay.

After weaning, the pigs were divided into 2 lots and placed on alfalfa pasture. One lot was fed 1 lb. of shelled corn per head per day during the pasture season and the second lot received 1.5 lbs. of shelled corn. For the 3 years the pasture season averaged 113 days. The lot fed 1 lb. of corn had an average requirement per 100 lbs. of gain of 248 lbs. of corn and the other lot required 277 lbs. of corn. The pasture requirements were at the rate of about 30 pigs per acre. When the pasture is divided into 2 parts and pastured alternately, with the addition of supplementary corn, the alfalfa should produce from 1,500 to 2,000 lbs. of pork per acre.

The rate of passage of food through the digestive tract of the hen, M. H. KEITH, L. E. CARD, and H. H. MITCHELL (*Jour. Agr. Research [U. S.], 34 (1927), No. 8, pp. 759–770*).—Two experiments are reported from the Illinois Experiment Station on the time required for whole corn, ground corn, and a mixture of ground corn and tankage 4 to 1 to pass through the digestive tract of hens. In preparing the hens for the experiment, they were fasted 60 hours, during which time they had access to water but no feed or grit. After this period they were fed 50 gm. of the feed. In the first experiment water was kept before them after feeding, and in the second test 75 cc. of water was given each bird, part of it mixed with the feed and the rest fed with a pipette. The birds were placed in separate cages and killed at varying intervals after feeding. The digestive tracts were removed, segmented, and the contents dried and weighed promptly. The sections used were (1) crop and tubes down to the proventriculus, (2) gizzard and proventriculus, (3) small intestine from gizzard to caeca, (4) caeca, and (5) large intestine including the cloaca. The excreta was also collected, dried, and weighed.

There was a wide variation in the rate of passage of the food between the various hens. Usually whole corn had left the crop by the end of 12 to 15 hours. The ground corn remained in the crop much longer than whole corn and somewhat longer than the ground corn and tankage. The amount of dry matter in other parts of the digestive tract did not differ materially with the three kinds of feed. The amount of dry matter in the gizzard in addition to the grit was larger while feed remained in the crop, and the same was more or less true of the small intestine.

The percentage of moisture in the crop varied widely and appeared to be independent of the kind of feed and the interval after feeding. In the gizzard the moisture content varied from 30 to 60 per cent and was usually about 1.5 to 2 times that of the dry matter not grit present. The moisture percentage in the small intestine averaged between 82 and 86 per cent, in the caeca 70 to 80 per cent, and in the large intestine 75 to 85 per cent. The amount of grit in the gizzard ranged between 8 and 15 gm., but no connection was observed between the amount present and any other factor.

[Poultry experiments at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 49–61*).—Several experiments are noted.

Egg-laying contest, R. B. Thompson.—The results of the first, second, and third Oklahoma egg-laying contests are reported. Detailed accounts are given

of individual and pen production, the amount and cost of feed consumed, and the average price per dozen of eggs during each month of the contests. The feeds used in these contests and the methods of feeding are described in detail.

Cottonseed meal, R. B. Thompson.—Ten pens of 15 Single Comb White Leghorns of uniform age and maturity were used in this experiment. The pens were numbered from 83 to 92, inclusive. Pen 83 received the regular college ration, consisting of 200 lbs. bran, 100 lbs. yellow corn meal or kafir meal, 100 lbs. pulverized barley or oats, 100 lbs. shorts, 75 lbs. meat scrap, 50 lbs. alfalfa leaf meal, 40 lbs. cottonseed meal, 15 lbs. dried buttermilk, 12 lbs. bone meal, 6 lbs. calcium carbonate, and 4 lbs. salt. Pens 84 to 92 received a basal mash of 2 parts wheat bran and 1 part each of gray shorts, yellow corn meal, and pulverized barley. To this was added in different lots varying amounts of raw cottonseed meal, with or without mineral supplement, and processed cottonseed meal. The processed meal was prepared by cooking in shallow pans under pressure until the meal turned brown. The mineral mixture consisted of 3 parts bone meal and 1 part each of calcium carbonate and sodium chloride. Whole oats was fed in the morning and a mixture of yellow corn and wheat in the afternoon to all lots.

Varying amounts of raw cottonseed meal gave practically uniform production. Adding minerals to such rations increased the rate of production and decreased the cost of feed per dozen eggs. Processed cottonseed meal was more efficient than raw cottonseed meal, but not as efficient as raw cottonseed meal plus mineral mixture. When raw cottonseed meal was fed in small amounts a high hatchability was obtained. The hatchability decreased as the amount of raw cottonseed meal increased. In the groups fed minerals little difference in hatchability was noticed between low, medium, and high cottonseed meal. The effect upon hatchability of processed cottonseed meal was directly opposite to that of raw cottonseed meal.

Time of hatch, C. W. Upp.—This study has been continued, and the results obtained are practically identical with work previously noted (E. S. R., 58, p. 173).

Culling, R. B. Thompson.—Wyandottes and mongrel birds were judged on their external characters and placed in classes good, fair, and poor according to merit. The average age at start of production and the first and second year's average production were determined. In both cases the good birds were youngest at the laying of the first egg and the poor were the oldest. The mongrels averaged younger than the Wyandottes. The total production for both years showed an appreciable difference in favor of the good as compared to the poor birds. In the case of the Wyandottes the good and the fair and in the case of the mongrels the fair and the poor showed little difference in egg production. This study will be continued to note the production of the progeny of the best and poorest producers when mated to the same male.

Yellow corn, cod-liver oil, etc., R. Penquite.—In continuing this study (E. S. R., 53, p. 173), it was found that it was impossible to secure good hatches when white corn, either with or without green feed, and whole wheat were fed as scratch feeds along with the mash previously noted. Cracked yellow corn, with and without cod-liver oil, and a mixture of oats, wheat, and yellow corn gave uniformly fair hatches. White corn alone as a scratch grain gave poor results for egg production, but when fed with green feed or cod-liver oil was practically equal to yellow corn. Wheat proved little better than white corn, and while hens so fed laid regularly they were weak and emaciated at all times.

Yellow milo, kafir, feterita, hegari, and darso have been compared with yellow corn and a mixture of oats, wheat, and yellow corn as scratch feeds for laying

birds. Definite conclusions can not be drawn from the limited material at hand, but hegari seems to compare quite favorably with yellow corn.

Correlation of physical measurements with egg production in White Plymouth Rock hens, C. W. Knox and H. A. Bittenbender (*Iowa Sta. Research Bul. 103 (1927), pp. 49–64, figs. 10*).—Sixty-five White Plymouth Rock hens that were finishing their first laying year were used in this study. They were measured the first two weeks in July and the last two weeks in August. The following measurements were made: Perimeter of ischium, thickness and span of pubic bones, and size of abdomen and body. These factors were studied in connection with the annual egg production.

The correlations of the measurements taken at different times varied with the same birds, especially the correlations of the span of the pubic bones with size of abdomen and with total egg production. This was also true of correlations between size of abdomen and size of body with egg production. No correlations with egg production were significant in July except the correlation of the perimeter of the ischium and size of abdomen with the size of body. In both months the perimeter of the ischium and the span of the pubic bones were correlated with size of body and with size of abdomen. The distance between the pubic bones was correlated to a greater extent with size of abdomen than with size of body. This was especially true in August. During this month the perimeter of ischium and thickness of pubic bones were correlated to a fair degree with egg production. Other correlations were insignificant. The perimeter of the ischium and size of abdomen had a fairly significant partial regression coefficient with total egg production in August. The other partial regression coefficients were insignificant.

The value of summer and fall egg production, C. S. Platt (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 9, pp. 4, figs. 2*).—The author points out that the summer-fall production of eggs is the most profitable from the standpoint of the New Jersey poultrymen. In order that birds may have a high production during this period it is necessary that they be in good flesh, that the houses and drinking water be cool, and that insect pests be kept down. The eggs should be collected and shipped frequently. It has been found from the data obtained at the Vineland Egg-Laying Contest of 1925–26 that only 20 per cent of the birds producing from October 1 to 15 represent the group, hence this is a most favorable time to cull the flock.

Rules and regulations for the fourth Utah intermountain egg-laying contest, B. Alder (*Utah Sta. Circ. 67 (1927), pp. 4, fig. 1*).—The rules and regulations for the fourth Utah intermountain egg-laying contest are here published.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 27–29*).—The results of several experiments are noted.

Comparison of kafir silage and cane silage for milk production, R. B. Becker.—A 90-day feeding trial with 8 cows showed little difference in the relative feeding value or palatability of kafir and cane silage.

Use of corn silage and mangels in the dairy ration, R. B. Becker, P. C. McGilliard, and A. C. Baer.—Two feeding trials revealed that dairy cows preferred and ate larger quantities of mangels than corn silage. Corn silage has a greater feed value per ton, since it contains larger amounts of dry matter than mangels.

Controlling flies that affect dairy cattle, A. C. Baer.—To test the value of commercial fly repellents, the college herd was divided into four groups. One

group receiving "fly salt," containing flowers of sulfur, was attacked by all flies as badly as an untreated group. Two fly sprays gave temporary relief to the cows. Removing manure frequently served to check the house and stable flies. One teaspoonful of formalin in a pint of skim milk was an economical poison for house flies. A mixture of 1 part of dalmation or pyrethrum powder and 3 parts of cheap talcum powder applied with a duster to the air of the stable was efficient for killing all flies present at the time of treatment.

Studies in calf feeding [and] cost of raising calves, P. C. McGilliard and Wagner.—Changing from whole milk to skim milk at 1 month of age, feeding whole grain instead of ground grain to 6 months of age, and using prairie hay instead of alfalfa were found to keep calves growing well. This ration caused little trouble from calf scours. Changing the milk from whole to skim reduced the cost of feeding one-third.

Pasturing sweet clover with dairy cows, B. Aune (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 24, 25*).—A 3-year rotation started in 1922 consisted of corn, barley seeded to sweet clover, and sweet clover pastured with dairy cows. In 1923, sweet clover furnished 82 days' pasture for 2 high-grade Holsteins. During this period they produced 4,070 lbs. of milk, yielding 180 lbs. of butterfat. The sweet clover that had been planted with barley in 1923 furnished 25 days' fall pasture, during which time 1,000 lbs. of milk, containing 45 lbs. of butterfat, was produced. In 1924, sweet clover seeded April 18 furnished 50 days' pasture, producing 1,900 lbs. of milk, which yielded 90 lbs. of butterfat. In 1925, the cows were pastured on this sweet clover plat from May 21 to August 27, and there was an additional 32 days' pasture for a single cow. The milk production during this period was 4,700 lbs., yielding 180 lbs. of butterfat. The 1925 seeding of barley and sweet clover furnished 40 days of fall pasture for 1 cow, which produced 618 lbs. of milk, yielding 24 lbs. of butterfat.

The quantity of milk varied little when the cows were changed to sweet clover from grass pasture, but the cows lost weight while on sweet clover. In 1923 there was one case of severe bloat when first turned on the sweet clover. When sweet clover is used more feed will be obtained if the pasture is divided and cattle kept off during irrigation. Handled in this manner, 1 acre should furnish 110 days of pasture on year-old sweet clover and 40 days on spring-seeded sweet clover.

The value of orange pulp for milk production, W. M. Regan and S. W. Mead (*California Sta. Bul. 427 (1927), pp. 16, figs. 3*).—The results of experiments with the effect on milk production of both dried and wet orange pulp are reported in continuance of work previously noted (E. S. R., 57, p. 273). The wet pulp showed the following chemical composition: Moisture 80.03 per cent, crude protein 1.71, nitrogen free extract 15.23, crude fiber 1.61, ether extract 0.75, and ash 0.67 per cent.

Eight cows were divided into two uniform lots and fed for two periods of 60 days each. The ration in both lots was the same except that during the first period group A received dried orange pulp and group B dried beet pulp. During the second period, these feeds were reversed. The remainder of the ration consisted of alfalfa hay and wheat bran. Records were kept of the amount of milk produced, and a daily composite sample was taken for butterfat determination. Dried orange pulp was not palatable, and cows refused to eat it unless mixed with other feeds.

The procedure with fresh orange pulp was similar to the above, except that changes were made in the rations and the feeding periods were for 30 days, using the double reversal system. Twenty-four cows in two lots were used, the test lasting 110 days. During the first and last 10 days, both groups were

fed on a basal ration consisting of alfalfa hay and a concentrate mixture of equal parts of ground barley, ground corn, and dried beet pulp. In addition each cow received 2 lbs. of cottonseed cake per day. Group A received the basal ration plus 20 lbs. of fresh orange pulp, which replaced 2 lbs. of alfalfa hay, during the first 30-day period. Group B received the basal ration only during this period. No difficulty was experienced in getting the cows to eat the fresh pulp.

The results of this test indicate that neither fresh nor dried pulp influenced the quality of milk produced. Dried orange pulp was approximately equal to dried beet pulp, and 100 lbs. contained approximately 78 lbs. of total digestible nutrients.

Dairy-herd improvement through cooperative bull associations, J. C. McDowell (*U. S. Dept. Agr., Farmers' Bul. 1532 (1927), pp. II+14, figs. 8*).—This supersedes Farmers' Bulletin 993 (E. S. R., 40, 79).

Testing and handling milk and cream (*Colorado Sta. Bul. 320 (1927), pp. 48, figs. 30*).—This is a popular presentation, in continuation of work previously noted (E. S. R., 52, p. 879). The object of the publication is to secure uniform methods of sampling and testing and to present sanitary methods for handling milk and cream. Appended are regulations governing the operations of companies, fieldmen, and cream station operators in Colorado.

Babcock testing: Principles and uses, L. K. Crowe and H. P. Davis (*Nebraska Sta. Circ. 35 (1927), pp. 27, figs. 10*).—An historical account of methods used to determine the butterfat in milk before the invention of the Babcock test serves as an introduction to this bulletin.

The principles involved in the Babcock test, the necessary equipment, the sampling, and preparation of the sample for testing are described in detail for whole milk, cream, skim milk, buttermilk, and whey. The cause and remedies for imperfect tests are pointed out. The causes of daily variation in the quantity and quality of milk, of butterfat variations in separated cream, and variations in milk and cream tests are explained.

Some factors other than bacteria that influence the body of artificial buttermilk, G. Knaysi (*Jour. Agr. Research [U. S.], 34 (1927), No. 8, pp. 771–784, fig. 1*).—In a study designed to determine whether or not the quality of buttermilk can be influenced by chemical means, it was found that the quality may be improved by the addition of various sodium salts to the milk before souring, but that such treatment results in an alteration of the flavor of the product even when the salts were in themselves tasteless. Heating the milk at 100° C. produced much better results than heating at 82°, this difference not being due entirely to the elimination of harmful microorganisms. A study of the mechanism of the chemical changes involved in making buttermilk suggested that the addition of a sodium salt to the milk and heating it would improve the quality of the resulting buttermilk, and the tendency of artificial buttermilk to whey off when incubated at rather high temperatures was found due largely to physical forces. The homogenizing of artificial buttermilk caused a separation of serum, and the homogenizing of the milk before souring produced no improvement. Under the conditions of the experiments described, gelatin, starch, and like substances did not improve the quality of the buttermilk produced.

[Experiments with dairy products at the Michigan Station] (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 139–143*).—The results of two experiments are noted.

Fluid milk market requires adequate cooling of milk for quality product, E. C. Scott (pp. 139–142).—Tests were made of the time saved by the surface

cooling of milk as compared to stirring in cans, and also of the temperature attained in an hour's time by the two methods. Seventy lbs. of milk in 10-gal. cans were tempered to 95° F. Cans were run in duplication. The water used in both methods was kept at 53°. One can was set in water without stirring; a second, third, and fourth were stirred every 5, 10, and 15 minutes, respectively; a fifth can was stirred continuously; a sixth was run over a conical cooler; and a seventh over a tubular cooler. Surface cooling was far more efficient than cooling in the cans, and the tubular was somewhat superior to the conical cooler. The more often the milk in the cans was stirred, the less was the time required to reduce the temperature. Allowing the milk to set in the can without stirring was very inefficient.

The bacteriological background of buttermaking.—IV, Lactic cultures or starters, E. D. Devereux (pp. 142, 143).—Continuing this series of studies (E. S. R., 53, p. 781), the desirable types of organisms used for starters are discussed. Directions are given for the preparation, care, and use of starters in butter making.

[Experiments with dairy products at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 30, 31, 32*).—The results of two experiments are noted.

Malt extract powder for ice cream, A. C. Baer.—When 2 or 3 per cent malt powder was used in a vanilla ice cream mix a distinct and agreeable malt flavor was produced. It also blended well with chocolate ice cream. When the malt powder is used with vanilla ice cream the cane sugar should be reduced 1.5 per cent when 2 per cent malt powder is used, and 2 per cent when 3 per cent malt powder is used. The malt powder contained 76 per cent sugar, 9 per cent malt dextrins, 7.65 per cent protein, 0.16 per cent fat, 1.83 per cent minerals, 1.13 per cent acid, and 3.7 per cent moisture.

Toxicity of buttermilk soured in zinc containers, F. Woodson and A. D. Burke.—To determine the toxicity of buttermilk stored in containers coated with zinc, two series of experiments were run. The first of these was with 4 lots of rats. All lots received a basal ration, to which was added in lot 1 plain buttermilk, lot 2 buttermilk soured in a zinc container, lot 3 buttermilk plus 1 per cent of zinc carbonate, and lot 4 1 per cent of zinc carbonate and no buttermilk. In lots 1 and 2 growth and reproduction were normal. Lots 3 and 4 were somewhat below normal in growth, and reproduction was retarded.

The second series was with 4 lots of 2 hogs each, averaging about 100 lbs. Normal rations were fed to all lots. In lot 1 this ration was fed from February 1 to April 12. From April 13 to May 10 zinc carbonate in amounts varying from 0.5 to 1 per cent was added to buttermilk. Lot 2 received plain buttermilk, lot 3 buttermilk from the creamery storage tanks, and lot 4 buttermilk made locally in galvanized-iron containers. No harmful effects upon growth or recurrence of heat periods were observed in the last 3 lots. In lot 1 the growth and health of 1 hog seemed to be affected.

A study of the principles of ice cream making (*Nebraska Sta. Rpt. [1926], pp. 10, 11*).—Continuing these studies (E. S. R., 51, p. 878), it was found that sherbets made from one-half skim milk and one-half water, or one-half whole milk and one-half water were practically as good as those made from whole milk. Powdered and condensed skim milk could be substituted for fresh skim milk when the milk solids were properly adjusted. Overruns above 50 per cent gave a poor body to sherbets. The addition of vegetable gums, such as gum tragacanth, retarded overrun, and gelatin increased overrun. Reducing the percentage of sugar in sherbets aided in keeping the product hard in refrigerator cabinets.

VETERINARY MEDICINE

[Report on animal diseases at the Nebraska Station] (*Nebraska Sta. Rpt.* [*1926*], *pp. 9, 10*).—In reporting upon an inquiry into the part played by avian tuberculosis infection in farm animals, a discussion of which has been noted from another source (E. S. R., 55, p. 776), the results of the typing of 175 specimens from infected swine are given. Of these, 71 were bovine, in which 38 were of mammalian origin, 7 avian, 3 mixed, and 23 negative. In 29 specimens from fowls, 27 were found to be avian, 1 mixed, and 1 negative.

Investigations were made of 17 outbreaks of fatal poultry diseases during the year without detecting the presence of the European fowl disease, which was discovered in the vicinity of New York City during the early part of 1925.

A study of a horse disease suspected of being caused by forage plants has thus far failed to detect the cause. The work in progress shows the principal damage to be sustained by the liver of the affected animals, and that the symptoms and death may be due to the severe deterioration of this organ.

[Work with parasites at the Louisiana Stations], H. MORRIS (*Louisiana Stas. Rpt. 1926, pp. 53, 54*).—It is stated that stomach worms in cattle were almost eradicated by the dry seasons of 1924 and 1925, in which the rainfall was far below normal. All mules owned by the university were treated for worms twice during the year with excellent results, the mules gaining in weight while at hard work and colic being practically eliminated.

Anthelmintic properties of santonin, J. E. SHILLINGER (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 9, pp. 839–845*).—The author here reports experimental work conducted in which tests of santonin were made on dogs, swine, and horses. The results obtained are considered to be in substantial agreement with the findings reported by Hall and Foster (E. S. R., 38, p. 883), in which it was found that single doses of 1 to 3 grains gave about 24 per cent efficacy in removing ascarids from dogs, and those of Mote (E. S. R., 52, p. 84) in which it was concluded that a value of 0 to 46 per cent appears to be within the actual range of utility for the drug in removing ascarids from swine. It is pointed out that all critical testing has shown an anthelmintic value for santonin much below what has been and is now being claimed for it in advertisements and in papers based on impressions gathered solely from seeing worms passed. In the opinion of the author its value is principally that of a drug which does not cause irritation of the gastrointestinal tract and thus is of value for use in repeated doses in cases of gastroenteritis with ascariasis, or in repeated doses for removing whipworms.

Methods of anthrax immunization, C. E. SALSBERY (*Jour. Amer. Vet. Med. Assoc.*, *70* (*1926*), *No. 3, pp. 359–371*).—In reporting upon the use of aggressin during the year it is stated that in 17 herds, consisting of 193 animals, where no vaccine or aggressin was used the losses amounted to 28.5 per cent. In 21 herds of 1,043 animals, in which simultaneous treatment was used and in most cases followed by spore vaccine No. 3, the losses amounted to 13.43 per cent, while in 14 herds of 1,280 animals on which anthrax aggressin was used the losses amounted to 3.9 per cent.

Infection of rats by Gärtner's bacillus, C. PRICE-JONES (*Jour. Path. and Bact.*, *30* (*1927*), *No. 1, pp. 45–54, figs. 2*).—The author concludes that rats can be readily infected with *Salmonella enteritidis* (Gaertn.) by feeding. In those which do not die there is some interference with growth at first, but afterwards the animals seem quite well. The bacillus can be found in the spleen and liver of nearly all the fed animals in about 48 hours, and after about 10 days begins to disappear so that at the end of about 2 months it can be recovered from only about 10 per cent. In a minority it survives at least 5 months. Specific

agglutinins develop and can be found long after the animal has got rid of the bacilli; agglutination persists particularly in animals which still harbor the bacilli. These surviving animals, which are to outward appearance healthy, can initiate an epidemic among fresh rats and can be reinfected.

Avian variola and cowpox [trans. title], G. BLANC and C. MELANIDI (*Arch. Inst. Pasteur Hellén., 1 (1926), No. 3-4, pp. 361-371*).—The authors have found in the experiments here reported that the virus of avian variola of fowl origin is incapable of producing any reaction in animals susceptible to cowpox, as the horse, sheep, and rabbit, and does not produce any immunity to cowpox. The fowl that is inoculated with the avian variola does not acquire any immunity to cowpox. They conclude that these viruses are clearly different.

***The use of goat virus in simultaneous inoculation against rinderpest* (preliminary report)**, T. TOPACIO (*Philippine Agr. Rev., 19 (1926), No. 4, pp. 297-309, figs. 5*).—The infectiousness of rinderpest-virulent goat blood through a single passage from cattle to goat is considered to have been uniformly established, and in one case the citrated blood kept in the refrigerator remained virulent even after eight days. Judging from the number of recoveries in test animals it is evident that the rinderpest virus had undergone attenuation even through a single transfer. Further attenuation of the goat virus appears to take place outside the animal body after 24 hours.

Abortion vaccine an important factor in the economic control of abortion disease, G. E. CORWIN (*Jour. Amer. Vet. Med. Assoc., 70 (1926), No. 3, pp. 323-334*).—The advantages gained from vaccination for infectious abortion are pointed out.

Bovine infectious abortion (Bang's abortion disease), I. F. HUDDLESON (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 147-153, figs. 2*).—The author here presents a practical account of the present status of knowledge of this disease under the headings of mode of infection, diagnosis, collection of blood samples, interpretation of the test, control measures, and pathogenicity of the abortion germ for humans.

***Recent advances in the protection of cattle and other animals against disease*.—IX, Coccidiosis with particular reference to bovine coccidiosis and its significance as an infection of cattle in India**, H. COOPER (*Agr. Jour. India, 22 (1927), No. 2, pp. 92-97, pl. 1*).—A summary of information on this disease in India.

On an infectious enteritis due to Bacillus enteritidis (Gaertner) in a herd of cattle, E. LEHR (*Berlin. Tierärztl. Wchnschr., 43 (1927), No. 17, pp. 274-280; abs. in Vet. Rec., 7 (1927), No. 22, pp. 481, 482*).—*B. enteritidis* (Gaertn.) was found by the author to be the cause of an affection which occurred among grown cattle, the organism being demonstrated to be present in feces, urine, and milk. Infected animals were detected by use of the agglutination test, the agglutinins being present in the blood at a very early stage.

Report of the poultry disease work conducted in co-operation with the experimental farms branch, F. C. ELFORD (*Canada Expt. Farms, Poultry Div. Rpt. 1925, pp. 54-58, figs. 2*).—Brief reference is made to the use of vaccines in combating roup and pox, applied previous to the appearance of the disease in the flock. In combating intestinal parasites among pullets, in the group kept on land free from infestation the mortality was 8.3 per cent and in the group kept under ordinary infested soil conditions 53 per cent. In the tests 30 pullets were kept in each pen, the conditions being as nearly alike as possible as to stock, housing, feeding, etc.

Serological tests for paratyphoid infections are briefly reported upon. In investigations of incubator transmission of *Bacterium pullorum*, the eggs from

a flock known to be free from infection were divided into two lots, one being placed in an incubator with eggs from a flock suffering from the infection and the other lot placed alone in the incubator. Both lots were removed directly from the incubators to separate brooders, the handling conditions in rearing being identical. Three days following hatching, chicks of the first lot, incubated with the infected eggs, developed all the clinical characteristics of bacillary white diarrhea. The organism was isolated from dead birds, 70 per cent of the 48 birds in the group succumbing to the infection. Chicks from the second lot, 51 in number, which had not been exposed to infection during incubation, were free of the disease at the end of 6 weeks, when the experiment was concluded.

During the year a total of 2,947 birds were blood tested for the detection of carriers of paratyphoid infections, mainly *B. pullorum*, of which 19.5 per cent gave positive reactions. The results of post-mortem examinations during the year are reported in tabular form.

Atypical symptoms and lesions occurring in chicks harboring Bact. pullorum, H. J. STAFSETH and E. P. JOHNSON (*Michigan Sta. Quart. Bul., 9 (1927), No. 4, pp. 155–157*).—The authors report observations of chicks which came from various parts of Michigan and which manifested symptoms and lesions somewhat different from anything previously encountered. The condition described was first noticed in chicks about two weeks of age that had died and were sent in by the hatcherymen for examination. Similar symptoms and lesions have since been observed in chicks coming from different parent stock, fed on different feeds, and kept under different conditions.

The affected chicks develop an abnormal thirst and remain at the water fountain continuously. A watery, brownish colored diarrhea occurs shortly after the symptoms begin, even to the extent that it is impossible to keep the floor of the brooder house dry. The chicks usually swell up, become very large, and are referred to by owners as being bloated or puffed up. These symptoms appear at the age of from 6 to 15 days, the chicks dying after from 4 to 6 days of illness. Although the feed has been suspected by the flock owners as the cause of the affection, the authors' investigations failed to confirm this view. An analysis showed samples of feed to contain from 1.5 to 2 per cent of salt, but feeding experiments failed to show any detrimental effects therefrom up to the end of two weeks, which confirms the finding of Mitchell, Card, and Carmen (E. S. R., 55, p. 671).

In autopsy and bacteriological studies, *Bacterium pullorum* was invariably found present. An organism that is a gas producer fermenting glucose, lactose, maltose, and mannite was also encountered, but on feeding this and injecting it into susceptible chicks neither the symptoms nor the lesions described were produced. The authors consider it probable that these symptoms and lesions are different manifestations of bacillary white diarrhea infection that may be brought about by some contributory influence that has not yet been discovered. A post-mortem examination of all affected chicks revealed a typical picture of dropsy. The subcutaneous tissues were filled and distended with a watery, edematous fluid, often gelatinous in consistency. The thoracic and abdominal cavities were usually filled with the same fluid. The heart was invariably very thin-walled and flabby. Frequently the liver was light yellow or ocher colored and very friable, and usually considerable unabsorbed yolk, that was either of a liquid or cheesy consistency, was found.

Variation in the reactions obtained in repeated agglutination tests of the same fowls with Bacterium pullorum antigen, J. R. BEACH (*Hilgardia [California Sta.], 2 (1927), No. 15, pp. 529–544*).—In this paper the author presents the results obtained in the first 12 of a series of at least 24 monthly

agglutination tests of the same fowls for the detection of *B. pullorum* infection, together with the results of the bacteriologic examinations of the fowls that died during the 12-month period. It is pointed out that complete interpretation of the results must wait until the experiment is terminated and a post-mortem and bacteriologic examination is made of all of the fowls. The studies, the results of which are presented in part in tabular form, have led the author to the following conclusions:

"Adult fowls with well-established ovarian infection with *B. pullorum* may not always react to an agglutination test. . . . A fowl that has reacted to an agglutination test may not react to subsequent tests, even though it is still infected with *B. pullorum*. . . . A positive reaction to the agglutination test may be considered as a highly accurate indication of *B. pullorum* infection. A negative reaction to a test, however, appears to less accurately indicate freedom from *B. pullorum* infection, either recently acquired or of long standing.

"In an agglutination test procedure with an antigen of equal or greater density than that used in these studies, a serum-antigen dilution at least as low as 1–25 should be included. Clearing of the 1–25 dilution alone or accompanied by clearing of one or more higher dilutions of the same serum can be interpreted as a positive reaction. No information regarding the interpretation of proagglutination or paradoxical reactions was obtained in these studies, since this phenomenon was not encountered."

The elimination of cloudy reactions by the use of formalin as a preservative for Bacterium pullorum antigen, J. R. Beach and S. Ter-Michaelian (*Hilgardia [California Sta.], 2 (1927), No. 15, pp. 545–553*).—This is a report of investigations in which comparison was made of the results of agglutination tests of the same sera with antigens containing varying amounts of phenol or formalin. The results obtained in the 4,322 comparative tests are considered to indicate that antigen containing 0.1 per cent formalin is satisfactory for making agglutination tests of blood serum from fowls. There was found to be little difference in either the number or distribution of the sera which reacted with the two antigens.

"In the tests in which four dilutions were used and in which reactions to both antigens in at least one dilution were obtained, more sera caused agglutination in the 1–100 and 1–200 dilutions of formolized antigen than in the corresponding dilutions of phenolized antigen. The cloudiness which occurred in 1,700 tests with phenolized antigen did not appear in the corresponding tests with formolized antigen. In this respect, the formolized antigen was more satisfactory than the phenolized antigen. It was observed that the clumps of bacteria formed by the agglutination of the organisms in the formolized antigen were smaller and more easily broken up than the clumps of bacteria in the phenolized antigen. This was of no importance when complete agglutination occurred, but did make the reading of partial agglutinations more difficult in the formolized antigen than in the phenolized antigen."

The production of gas by Salmonella pullorum, K. Goodner and H. G. May (*Rhode Island Sta. Bul. 208 (1927), pp. 12, fig. 1*).—This is a report of investigations conducted in continuation of those by May and Goodner previously noted (E. S. R., 55, p. 275).

The studies here reported have shown that the division of *S. pullorum* into types A and B is unwarranted. It is pointed out that high temperatures are unfavorable for gas production by *S. pullorum*, and that the anaerogenicity reported is an example of such an inhibition. *S. pullorum* is an organism which at its true parasitic temperature is unable to ferment simple carbohydrates with the production of gas, while at temperatures analogous to those

under which it is saprophytic in nature it exhibits the property of gaseous fermentation. It is suggested that this may be either a special adaptive mechanism or merely a matter of inhibition of the production or action of certain enzymes at higher temperatures. The effect of variation of the concentrations of the ingredients of a simple carbohydrate broth is reported upon as regards gas production by *S. pullorum*. A medium has been devised by the authors which, under proper conditions of incubation, is distinctly favorable for the early and vigorous production of gas by *S. pullorum*.

Fowl typhoid, F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 7, pp. 4*).—This is a practical account on fowl typhoid, its resemblance to fowl cholera and adult bacillary white diarrhea infection, and its prevention and treatment.

Bacillary white diarrhea, B. F. Kaupp and R. S. Dearstyne (*North Carolina Sta. Tech. Bul. 29 (1927), pp. 47, figs. 17*).—This is a second report (E. S. R., 54, p. 176) by the authors of investigations of the septicemic diseases of poultry. The present investigation has involved the determination of the extent of bacillary white diarrhea in the State, the study of its dissemination through the carrier bird, the reliability and efficiency of the agglutination test for removal of carriers, and the factors of possible control. The experimental work was based upon a study of two flocks of infected birds, representing the heavy and light breeds, which had been condemned by the State as reactors to the agglutination test. The conclusion, based on State testing records of 11,914 birds in 1925 and 39,766 in 1926, is that well over 9 per cent of the fowls in the State are infected.

In their discussion of pathological changes the authors present tabulated records of the pathological lesions found in 500 chicks dying of the disease, from all of which the causative organism was recovered, and in 44.6 per cent from two or more of the internal organs. Tabulated data are given on the symptoms of the disease in adults, including the results of respiration, temperature, agglutination tests, and blood studies. It is concluded that the chances of transmission of the disease from adult to adult are remote, provided the ground has not been previously occupied by infected chicks. In the flocks of reactors studied during the course of the investigation, negative control birds placed with reactors failed to react within a period of 15 months as members of the infected flocks.

In reporting upon studies of the carrier bird, it is stated that a well-defined positive reaction was obtained at 4 months from 1 of 6 birds reared from infected stock. The localized condition of the disease does not noticeably affect the respiration, there may be temporary elevation of temperature, the annual body weight curve follows that of normal birds, there is a distinct tendency to nest more often than the normal bird, and the death rate in carrier birds is abnormally high. The percentage of infected eggs laid by carrier birds was found to be 7.31 in 1,313 eggs examined from the heavy breeds, 5.23 per cent in 2,505 eggs laid by Leghorns, and 5.94 per cent in the total of 3,818 eggs examined. The percentage of egg infection rises as production increases, and reaches its greatest height at the season of maximum production. It is concluded that the carrier bird may be profitable from an egg-production standpoint during the pullet year.

The mortality from *Salmonella pullorum* infection commences in the shell, 48 of 175 chicks, or 27.4 per cent of all the chicks dead in the shell on the twenty-first day of incubation of eggs from carrier birds, having revealed infection with *S. pullorum*. In comparison with this figure, only 4, or 0.4 per cent, of 1,000 chicks dead in the shell on the twenty-first day of incubation in

hatcheries using only eggs from blood-tested stock, showed the presence of this organism.

Eradication work with the disease in the State has been under way since 1925, the agglutination test being depended upon for the eradication work conducted by the veterinary division of the State Department of Agriculture. In flocks of reactors studied, the agglutination test would have removed 90 per cent of the carriers if applied at any time in one flock of 29 reacting birds held 14 months; 98 per cent of the carriers in an infected flock of 21 birds studied for 6 months, if applied at any time, and 98 per cent of the carriers of avian typhoid in a flock of 50 birds studied 6 months, if applied at any time during that period. The intermittent results obtained on application of the agglutination test to carrier birds in some instances is established. These investigations show that the intermittent reactor delivers infected eggs during continuous months of negative reactions, and probably never recovers from the disease.

The results of monthly serological tests and pathological examinations of the eggs laid by the fowls tested are graphically illustrated. The pathological lesions detected and the result of culture tests, reported upon in detail in tabular form, confirm the positive agglutination reactions. Pathological lesions were found in 92.9 per cent of 362 hens and 69.6 per cent of 135 pullets. The ovaries are the principal site of localization of the disease in birds of both classes. In hens the heart structure revealed alterations in 14.7 per cent, while involvement of this organ was found in 25.5 per cent of the pullets. *S. pullorum* was isolated from 70.3 per cent of the hens and 57.4 per cent of the pullets, and the heart structure of 2 of 5 males examined showed the presence of the organism. The evidence indicates that the disease is not thrown off by the adult carrier bird, infection being always present in the true reactor.

A bibliography of 34 titles is included.

Regarding vaccination and medication for control of roup, H. BUNYEA (*Rel. Poultry Jour.*, *33* (*1926*), *No. 10*, *pp. 615*, *654–656*).—Reporting upon studies conducted, the author concludes that birds about one year old are more susceptible to roup than those two years old or older under the same housing conditions. The progress of roup is appreciably influenced by secondary invaders. *Staphylococcus aureus* is a frequent and virulent secondary invader in roup. Autogenous flock bacterins prepared from *S. aureus* appear to be effective in the prevention of the disease, as well as the treatment of incipient cases involving this organism, even under unfavorable climatic conditions. Heterogeneous bacterins made from *S. aureus*, when used in roup outbreaks in which *S. aureus* is the known active secondary invader appear to be equally as effective as autogenous bacterins in the control of the disease. Antiseptics in the drinking water (permanganate of potash, and bichloride of mercury in particular) do not appear to have any appreciable curative virtue and very little preventive property in the treatment of roup. The local external application of solutions of mercurochrome or silver nitrate is not very effective in either prevention or treatment.

The substitution of nicotine sulphate (40 per cent nicotine) solution for tobacco dust in the treatment of roundworms in poultry, F. C. OTT and G. W. KNOX, JR. (*Louisiana Stas. Rpt. 1926*, *pp. 88*, *89*).—The work thus far conducted indicates that there may be considerable danger in recommending the use of nicotine sulfate solution generally to poultry men. It was found that unless the solution is mixed thoroughly before it is drawn from the container and unless it is approximately 40 per cent, there is nearly always danger of prostrating the birds and oftentimes of killing them. It was found that the highest limits of the solution which can be given without toxic effects in chickens in individual dose is 9 cc. of 40 per cent nicotine in a

nicotine sulfate solution in 991 cc. of water. In flock treatment where it is mixed with the mash, it is possible to increase the solution to 10 cc. of nicotine sulfate solution, 40 per cent nicotine in 990 cc. of water. The results obtained from the use of nicotine sulfate have not as yet been tabulated, and the iodine suspensoid, after the formula of Chandler, used as a check, has not been administered long enough to warrant a report.

Worm parasites of Philippine chickens, M. A. Tubangui (*Philippine Agr. Rev., 19 (1926), No. 4, pp. 327–367, pls. 2, figs. 19*).—In the first part of the paper the author reports upon the frequency of occurrence of 18 different parasites in 93 chickens observed, discussing the effects of parasites on the host, symptoms, diagnosis, treatment, and prevention. In the second part of the paper descriptions of the parasites are given, together with illustrations. A bibliography is included.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Nebraska Station] (*Nebraska Sta. Rpt. [1926], pp. 8, 9*).—It is reported that the plow draft investigations indicate that the draft of a plow is not affected by the increased moisture content of the soil at low values. The draft was increased very rapidly with one soil after 50 per cent of moisture content was reached, and the point of maximum draft was not obtained.

The progress results of the poultry house ventilation and construction studies indicated that, among the factors studied, light is the most important single factor affecting egg production. The results obtained with houses that were heated were not encouraging. The unventilated house gave very fair average results as compared with all other units, and during the month of December its flock was the best producer.

Surface water supply of Colorado River basin, 1923 (*U. S. Geol. Survey, Water-Supply Paper 569 (1927), pp. V+189, fig. 1*).—This report, prepared in cooperation with the States of Colorado, Wyoming, Utah, and Arizona, presents the results of measurements of flow made on streams of this basin during the year ended September 30, 1923.

Surface water supply of lower Columbia River and Pacific slope drainage basins in Oregon, 1923 (*U. S. Geol. Survey, Water-Supply Paper 574 (1927), pp. V+194+LI, pls. 3*).—This report, prepared in cooperation with the States of Oregon and Washington, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1923.

Surface water supply of the United States, 1924, Parts 3, 4 (*U. S. Geol. Survey, Water-Supply Papers 583 (1927), pp. VI+298, pls. 3; 584, pp. V+147, pls. 3*).—These papers present the results of measurements of flow made on streams in the following basins during the year ended September 30, 1924: Parts 3, Ohio River basin (in cooperation with the States of New York, West Virginia, Ohio, Illinois, Tennessee, North Carolina, and Alabama); and 4, St. Lawrence River basin (in cooperation with the States of Wisconsin, Ohio, and New York).

Run-off from small agricultural areas, C. E. Ramser (*Jour. Agr. Research [U. S.], 34 (1927), No. 9, pp. 797–823, figs. 15*).—In a contribution from the U. S. D. A. Bureau of Public Roads data from measurements of rainfall on and run-off from six small agricultural watersheds of silt loam soil, ranging in area from 1.25 to 112 acres, are reported.

The results show conclusively that timber has a decided influence in reducing the rate of run-off from a watershed. However, this influence appears to be slight when the maximum rate of run-off occurs after considerable rain already

has fallen. This is attributed to the fact that interception and percolation on timbered areas are much greater at the beginning of a rain than later, so that an increasingly greater proportion of the rainfall runs off as the rain continues.

A comparative study of the rates of rainfall and run-off for different storms showed apparently unaccountable variations in the run-off coefficients. "There are many interdependent factors entering into the relation between rainfall and run-off, and it is practically impossible to evaluate all of them accurately. For instance, the effect of previous rains upon the capacity of the ground to absorb water from subsequent rains depends upon the nature and amount of previous rainfall, the interval of time between rains, and the amount of water lost through transpiration and evaporation during this interval. If the maximum rate of rainfall occurs at the beginning of the rain, before the surface of the ground has been thoroughly wetted, the percentage of run-off is less than when the maximum rate occurs some time after the beginning of the rain. A greater percentage of run-off also occurs for heavy than for light rains. . . . Nonuniformity in the rates of rainfall during the time of concentration is responsible for considerable variation in the run-off coefficient for the same watershed."

The application of hydrodynamics to irrigation and drainage problems, O. W. ISRAELSEN (*Hilgardia [California Sta.], 2 (1927), No. 14, pp. 479–528, figs. 17*).—In addition to a consideration of the fundamental hydrodynamical equations, the primary purpose of this paper is to review briefly the efforts which have been made to apply the principles of hydrodynamics to the solution of soil moisture problems and to indicate the possible outlook for future investigations.

The preliminary analysis presented is somewhat general in character and applies to both gases and liquids. The application of the more general equations to irrigation and drainage problems permits some restrictions, which are pointed out, before developing the general equation of motion and the equation of continuity in its general form. Brief reference is made to the forces which influence the flow of water in open channels and in pipes.

The conclusion is drawn that a knowledge of the laws which govern the movement of ground water and soil moisture is essential to its effective control, and that the fundamental hydrodynamical equation of motion and the equation of continuity may be applied to irrigation and drainage problems. For irrotational motion the velocity may be derived from a potential, and the driving forces in the formula for flow of water in open channels and in pipes are derivable from a potential.

It was further found that applications of hydrodynamics to ground water and soil moisture movement have been made by only a few investigators. The capillary potential can be measured in the laboratory with the aid of porous cups, and the methods used are described. The capillary potential was found to be a function of the moisture content. An analysis of 84 determinations of the relation of capillary potential to moisture content suggests that it may be represented by an equilateral hyperbola of the form $(\rho'-a)(\psi+b)=c$, in which ρ' is the moisture, Ψ is the capillary potential, and a, b, and c are constants.

It was found that the moisture distribution at equilibrium in a vertical soil column is not uniform but decreases with height above the water table. Such distribution qualitatively confirms the requirements for an equipotential moisture region.

[Drainage investigations at the Belle Fourche (S. Dak.) Field Station, 1923–1925], B. Aune (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 33–35, fig. 1*).—Data on the tile drainage of irrigated heavy gumbo soil are briefly presented.

Direct production costs of broken stone, G. E. Ladd (*U. S. Dept. Agr., Misc. Circ. 93 (1927), pp. 71, figs. 27*).—This is essentially a reference work on direct costs of broken stone in terms of labor, power, and materials, and of money, and the relations of these costs to methods and conditions. A large amount of data is presented and analyzed.

Peat as a domestic fuel, G. Fletcher (*Irish Trade Jour., 2 (1927), No. 7, p. 103*).—Information relating to the use of peat as domestic fuel is briefly presented. Data on the calorific values of peat from Irish bogs indicate that the air-dried peat averages about 7,200 B. T. U's. per pound. Air-dried peat from various countries may vary from about 7,000 to 10,500 B. T. U's. per pound. The peat from Irish bogs is usually of higher calorific value. A comparison of peat and coal indicates that the relative heat values may be taken as 2 : 3, or that 3 tons of peat are equivalent to 2 tons of coal.

Harvesting wheat with a combined harvester-thresher in the Great Plains region, 1926, R. S. Kifer, W. R. Humphries, and J. H. Martin (*U. S. Dept. Agr., 1927, pp. 26, fig 1*).—The results of a cooperative study by the Bureaus of Public Roads, Agricultural Economics, and Plant Industry with the Texas, Oklahoma, Nebraska, and Montana Colleges of Agriculture of the use of the combined harvester-thresher are reported.

The combine has been found to give general satisfaction in harvesting wheat in the Great Plains region. The advantages found are that it lowers the cost of harvesting and threshing, reduces the amount of labor required, and shortens the harvesting and threshing period. It was found that grain cut annually by combines of all types and sizes averaged 553 acres per machine. The capacity of the machine is primarily dependent upon the width of cut and the length of the harvest season.

The more important elements of cost for harvesting with a combine were charges for labor, fuel, repairs, depreciation, and interest on the investment. For all combines the depreciation averaged 44 cts. per acre. There was no apparent relation between the acres cut annually and the estimated life of the machine. The per-acre depreciation charge was less for large than for small acreages cut by the same size of machine.

For small acreages the expense of harvesting with a combine was greater than for either a binder or header. Where only the usual direct costs are considered, 100 acres could be harvested as cheaply with a binder or header as with a small combine. The average harvesting loss with combines was found to be 2.6 per cent of the total yield, as compared with 3.3 per cent for a header and 6.1 per cent for a binder.

Results of "combining" and grain drying tests in Wisconsin, F. W. Duffee (*Agr. Engin., 8 (1927), No. 3, pp. 55–57, figs. 4*).—Results of studies conducted at the Wisconsin Experiment Station are reported, which indicate that forced ventilation without artificial heat will usually be necessary, at least with barley. The cost of forced ventilation will probably be less than 1.5 cts. per bushel under ordinary conditions where 1,000 bu. or more are handled in this way, and the 1,000 bu. need not all be one grain. It appears that this method produces seed with as good germination and as free from molds as ordinary methods.

Results of research in feed grinding, G. W. Kable (*Agr. Engin., 8 (1927), No. 3, pp. 53, 54, figs. 3*).—The results of studies conducted at the Oregon Experiment Station on feed grinding are briefly presented.

It was found that for fine grinding the hammer mill ranks first, followed in order by the burr and roller mills. The temperature increase in ground grains was found to vary from 4 to 58° F., and varied almost directly with the power used per 100 lbs. ground. Practically the same temperature changes took place when using the roller mill as when using burrs, and the causes of the increases were either the close setting of burrs or rolls or a reduction in the rate of feeding.

Tests of coarse, fine, and crowfoot burrs showed that the fine burrs gave greater capacity in the stover mill for the same degree of fineness than the crowfoot burrs and required considerably less power. The power per unit of grain ground increased rapidly when the burr clearances were very slight. In general the throat opening was found to have a greater influence on the fineness of grinding than any other factor. Increasing the speed of the mill resulted in proportional increases in capacity and a reduction in the power requirements per 100 lbs. ground. When containing the same percentage of moisture, oats showed the greatest power requirement per unit ground, followed in order by barley, wheat, and corn. This order obtained with all mills regardless of type.

Burr mills were found to have the advantage of low first cost, combined with the ability to produce a reasonably fine feed, but they are only moderately effective for very fine grinding. They require closer attention than roller or hammer type mills and will clog easier and need more frequent replacement of grinding parts. The chief advantages of hammer mills are their ability to handle almost any product from straw to stone, and to grind very fine without clogging or being seriously injured by foreign matter in the grain. The main disadvantage is their high cost.

Ropework for the farm: Useful knots, hitches, and splices, J. M. Smith (*Alberta Univ., Col. Agr. Bul. 9, 2. ed. (1927), pp. 36, figs. 64*).—This is the second edition of this publication. It contains sections on essential knots and hitches, useful knots and hitches, splicing, halters, finishing the ends of rope, emergency halters, and casting cattle.

Knots and splices: The use of rope on the farm, E. W. Kendall and L. Stevenson (*Ontario Dept. Agr. Bul. 327 (1927), pp. 14, figs. 19*).—Practical information is presented on the use of rope on the farm and on the making of knots and splices for various purposes.

Farm barns, E. W. Kendall and L. Stevenson (*Ontario Dept. Agr. Bul. 326 (1927), pp. 23, figs. 16*).—Practical information on barn planning is given, together with working drawings of different barn types adapted to Ontario conditions and bills of material.

Plans for a New Jersey laying house, E. R. Gross and D. B. Lucas (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 8, pp. 4, figs. 5*).—Drawings and a suggested bill of materials for a slightly modified New Jersey multiple unit house are presented.

Running water in the farm home, M. R. Lewis (*Idaho Agr. Col. Ext. Bul. 66 (1926), pp. 15, figs. 6*).—Practical information on the planning and installation of water supply systems for farm homes is presented. It is pointed out that in most parts of Idaho good water may be obtained from underground sources. While shallow wells are satisfactory if carefully located and protected, the deep wells have been found to supply the safest drinking water.

Algae in water supplies, N. L. Huff (*Jour. Amer. Waterworks Assoc., 15 (1926), No. 5, pp. 496-504*).—The present account deals with various means and

methods of lowering and controlling the numbers of algae which tend to become objectionable or dangerous, several forms of which are described. The blue-green algae are the most objectionable. The most effective general method at present known consists in the use of copper sulfate, regarding the proportions of which no rule is attempted, though guiding information is detailed. All the blue-green algae which cause trouble in the water supply sources are sensitive to copper sulfate, disintegrating and disappearing in two or three days after adequate treatment. Any tendency on the part of troublesome forms, such as Spirogyra, Anabaena, and Clathrocystis, to increase rapidly may be quickly checked by the proper application of copper sulfate, leaving no serious after effects of odors and tastes.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1925–26, pp. 10–13*).—Results are reported as follows:

Tenancy and ownership.—Investigations by J. T. Sanders, made in cooperation with the U. S. D. A. Bureau of Agricultural Economics, showed that over one-half of all tenants in the State in 1924 had moved on the farms then rented during the year, those moving being nearly 66 per cent in a number of southeastern counties, and from 20 to 40 per cent in a number of northwestern counties. Eight per cent of owners also moved during the year. Of over 2,000 farmers who moved, 54 per cent gave economic betterment as their reason, 17 per cent economic reverses, 7 per cent family betterment, and 2 per cent were quitting farming. The average cost per move for man labor—not including labor of women and children, horse work, and wear and tear on household goods and machinery—was $30. The children of farmers whose average stay was less than 50 per cent of the average stay of all farmers made an average of 0.64 grade per year of school life, as compared with 0.75 grade per year for children of farmers whose average stay was longer than 50 per cent of the average stay of all farmers.

Cooperative cotton marketing.—In studies by W. W. Fetrow enumerators visited 519 members of the Oklahoma Cotton Growers' Association and 336 nonmembers and recorded their answers to questions regarding the association and their attitude toward it. A few of the results obtained on the several subjects are given. Economic condition of the farmer was found to be the greatest handicap to cooperative marketing in the State, the effect of tenancy being shown by the fact that out of each 100 members of the association only 62 were tenants as compared with 74 out of each 100 who were nonmembers.

The farmers included in the survey had 59 per cent of their crop land in cotton. Receipts from cotton made up 78 per cent of all receipts from farm products, being 44 per cent in the case of owners and 87 per cent in the case of tenants. Twenty-five per cent of the owner members of the association, 27 per cent of the nonmember owners, and 53 per cent of all tenants were borrowers from banks or merchants. Of the loans made on personal and collateral notes, 55 per cent were made in the first three months of the year, when preparations were being made for the year's work, and approximately 80 per cent came due in the last three months of the year, when the cotton crop was being marketed.

The apple industry in the United States: A selected list of references on the economic aspects of the industry together with some references on varieties, compiled by L. O. Bercaw (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 19 (1927), pp. II+170*).—A mimeographed selected list of references, chiefly books, bulletins, and pamphlets on the economic aspects of the

apple industry in the United States. Some references on varieties are also included.

The peach situation in the Southern States, M. R. Cooper and J. W. Park (*U. S. Dept. Agr., Dept. Circ. 420 (1927), pp. 24, figs. 10*).—Carload shipments of peaches from Georgia and from North Carolina, South Carolina, and Alabama increased from 5,987 and 607 cars, respectively, in 1920 to 18,019 and 2,803 cars, respectively, in 1926. Tennessee, Arkansas, and Texas also shipped more than 2.5 times as many carloads during the three years 1924–1926 as during the four years 1920–1923. Based on a survey made in 1925 of peach trees in commercial orchards, and assuming that all trees 10 years old and older in 1925 are out of bearing and that no others die or are replaced, it is estimated that the number of bearing trees in the seven Southern States in 1929 will be 38 per cent greater than the number in 1925. The 1925 survey showed that 67 per cent of the peach trees in the seven Southern States were not over 5 years old, and that only 9 per cent were 10 years old or older. It also indicated that in 1924 the average yield per tree was 0.19 bu. on 4- and 5-year-old trees, 0.85 bu. on 6- and 7-year-old trees, 1.28 bu. on 8- and 9-year-old trees, and 0.75 bu. on trees 10 years old or older.

The market outlets, shipments, prices received, etc., for the seven Southern States during 1923 to 1926, inclusive, are described.

The competition of southern peaches with northern peaches, melons, and other fruits is discussed, it being pointed out that 36 per cent of all peach trees less than 6 years old reported in the 1925 survey were in Michigan, Illinois, New Jersey, Pennsylvania, New York, and Virginia. It was also pointed out that but little relief can be expected from increasing the distribution area for peaches from the Southern States, and that the extent to which consumption of southern peaches at remunerative prices can be increased in the present distribution area is problematical. Improved cultural methods, stricter grading, growing standard varieties, and better control of distribution are pointed out as possible means of stabilizing prices and improving conditions in the Southern States.

An economic study of poultry farming in western Washington, G. Severance (*Washington Col. Sta. Bul. 216 (1927), pp. 51, figs. 10*).—This report is based upon 53 complete farm records and 54 enterprise records covering the year ended September 30, 1924, and 60 complete farm records and 35 enterprise records for the year ended September 30, 1925, together with statistical data from the Federal Census, the U. S. D. A. Bureau of Agricultural Economics, and the extension service of the State College of Washington. The farms included were those on which poultry was maintained on a commercial scale, and where the production of market eggs was a major poultry enterprise.

Of the 131 farms included in the survey, 78 were engaged in poultry raising alone, 16 in poultry and berry raising, 24 in poultry raising and dairying, and 13 in poultry raising and the raising of other crops. The average labor income per farm of the 53 farms for which complete records were secured for the year ended September 30, 1924, varied from $206.15 on farms with less than 500 birds to $1,985.98 on farms with over 2,000 birds, and the average for the 60 farms for the year ended September 30, 1925, varied from $417.49 on farms with less than 500 birds to $2,652.16 on farms with from 1,501 to 2,000 birds. The records for the year ended September 30, 1925, showed the average labor income to have been $943.90 on 38 specialized poultry farms, $624.03 on 7 poultry and dairy farms, $1,093.80 on 2 poultry and berry farms, and $517.17 on 10 farms with poultry and other crops.

On the farms studied, feed cost constituted from 32 to 70 per cent of all expenses, averaging 59 per cent. Labor costs varied from $1.36 and $1.97,

respectively, per bird in the two years for flocks of less than 500 birds to $1.10 and $1.12, respectively, per bird for flocks of from 1,001 to 2,000 birds. The cost for flocks of over 2,000 birds was 90 cts. per bird during the year ended September 30, 1925.

Data are included regarding the poultry industry in the United States and the State of Washington. Production records, grades and prices of eggs, feeding and other practices, labor costs, and the outlook for and the opportunities in the poultry industry in Washington are discussed.

The horse and mule outlook, B. H. FRAME (*Missouri Sta. Circ. 157 (1927), pp. 12, figs. 3*).—A study is made of the number of horses and mules on farms and not on farms in the United States, 1910–1927; prices received for horses in the United States, 1910–1925; colts foaled per 1,000 horses and mules in the United States, 1910–1926; number of horses and mules on farms in Missouri 1910–1927; and the monthly farm prices of horses in Missouri, 1916–1926.

The numbers of horses and mules in 1927 were 77 and 186 per cent, respectively, in the United States, and 63 and 104 per cent, respectively, in Missouri of the numbers in 1910. The average annual price of horses in the United States decreased from $146 in 1910 to $76 in 1924, and then increased to $78 in 1925. The average annual price in Missouri decreased from $113.67 in 1916 to $52.75 in 1924, and then increased to $55.38 and $60.88, respectively, in 1925 and 1926. During the period 1916–1926 the average monthly prices of horses in Missouri gradually decreased from a maximum of $88.09 in May to a minimum of $75.27 in December. The number of colts foaled per 1,000 horses and mules in the United States decreased from 87.7 in 1910 to 63 in 1920, and to 33.8 in 1926.

The conclusions drawn as to what will probably happen in the future are as follows: (1) Eventually horses and mules must reach a new level of normality, (2) the horseless farm has not come and will not come in the near future, (3) the future demand will be for medium-weight, general-purpose horses and for mules adapted to eastern and Cotton Belt farming, and (4) colts that can be raised cheaply will bring remunerative prices when at working age.

Feeding and marketing of early spring pigs on Indiana farms, O. G. LLOYD and G. E. YOUNG (*Indiana Sta. Bul. 310 (1927), pp. 14, figs. 6*).—This bulletin gives the results of a study of the detailed records on 67 farms in 4 west-central counties of Indiana of the cost of producing pork in the years 1922–1925. The grain ration fed was used as the basis of classification, full-fed pigs being those fed corn, other grain, or mill feed during the entire feeding period, and limited-fed pigs those to which less than a full feed of grain was fed during the first three months after weaning. The pigs on the farms studied were farrowed before April 1.

The effects of the rate of feeding on market price received, on efficiency in the use of feed, on the cost per 100 lbs. of gain, and on farm management were studied. The following table gives the average results for the four years of the study:

Full-fed v. limited-fed pigs on 67 Indiana farms, 1922–1925

Kind of feeding	Number of records	Date of sale	Selling age	Sale weight	Selling price per 100 lbs.	Cost per 100 lbs. gain	Feed per 100 lbs. pork: Corn	Feed per 100 lbs. pork: Tankage	Death rate after weaning
			Days	*Lbs.*			*Bu.*	*Lbs.*	*Per cent*
Full-fed	24	Sept. 27	202	188	$10.12	$6.82	6.13	8.21	2.5
Limited-fed	43	Dec. 10	265	212	9.15	7.51	5.73	4.87	7.5

The tables included give similar data for the individual years.

The averages for the four years for the different items of cost of producing 100 lbs. of gain for full-fed and limited-fed pigs were, respectively, feed $5.30 and $6.31, pasture 30 and 31 cts., labor 28 and 32 cts., equipment 12 and 11 cts., incidentals 8 and 18 cts., and overhead 24 and 28 cts.

The advantages pointed out for early farrowing and full feeding are as follows: Pigs can be marketed in September when the market price is normally from $1 to $2 higher per 100 lbs. than in November and December; the profit per 100 lbs. of gain is greater; an average of 2.5 bu. less corn is required per 100 lbs. of gain; the death rate after weaning is lower; pastures, shelters, and more of the farmer's time are available for fall pigs; size of business may be increased, due to more efficient use of feed, labor, and equipment; and swine sanitation problems are more easily solved.

Marketing Indiana onions, F. C. Gaylord (*Indiana Sta. Bul. 308 (1927), pp. 36, figs. 32*).—Information is given on the extent of commercial onion growing, the markets for onions, and the present marketing methods used in Indiana.

Lack of proper grading is pointed out as a source of severe losses to growers, 407 cars in 1924–25 and 1925–26 out of 2,342 cars failing to make the grade by an average of 9.90 per cent, or 4.9 per cent more than the tolerance allowed. Data from 1,100 cars shipped during the season 1923–24 showed that cars making the United States No. 1 grade brought from 25.1 to 94.8 per cent more than cars which had been screened for size, but which overran the tolerance allowed for undersize, rot, blemishes, and other grade defects.

Sample crates from 85 storage houses in 1925–26 showed an average loss of 11.35 per cent, due to sprouts, rots, small onions, and other causes. The percentage of loss, exclusive of moisture loss, in 21 storage houses in which the onions were dry, mature, well cured, and rigidly graded varied from 1.8 to 15.6 per cent, averaging 4.8 per cent, while in 9 houses in which the onions were poorly graded and cured, some being green and damp, and others frosted or frozen, the loss varied from 7.7 to 34.3 per cent, averaging 22.4 per cent.

Some data are included on the effect of seed, rate of seeding, and fertilizing on yields, and of these factors and harvesting methods on the quality of onions. Some of the mistakes made by growers who ship their own crops are discussed.

Indiana peaches, F. C. Gaylord (*Indiana Sta. Bul. 309 (1927), pp. 20, figs. 11*).—Information is given regarding grades of peaches shipped, months in which shipments are made, markets to which shipped, and prices received for different grades of Indiana peaches shipped in carload lots in 1926.

The marketing of Delaware eggs, C. L. Benner and H. S. Gabriel (*Delaware Sta. Bul. 150 (1927), pp. 47, figs. 4*).—The poultry industry of Delaware, the principal markets for Delaware eggs, and the requirements of each market, and the storing, assembling, grading, packing, and marketing practices in Delaware are described. A study, based on 54 doz. eggs purchased at different Wilmington stores on March 7, 1927, of the effects of cleanliness, weight, and quality of eggs, and the type and location of store upon prices, and a study of the grades and condition of eggs and methods of packing based on 13 cases of Delaware eggs inspected at the Jersey City Terminal, New York City, are included.

Some statistical characterizations of the hog market, K. Bjorka (*Iowa Sta. Research Bul. 102 (1927), pp. 48, figs. 41*).—The study reported in this bulletin includes (1) the secular trend from 1869 to 1925, cycles for 1878 to 1914, seasonal characteristics from 1878 to 1914, and the short time and irregular fluctuations of hog prices at Chicago; (2) the effects on hog prices of daily,

weekly, and seasonal receipts, pork products prices, pork exports, and storage holdings; (3) hog price differentials between grades at the same market; (4) hog price differentials between markets; and (5) the corn-hog price ratio. The study is based upon data supplied by the Market News Service of the U. S. D. A. Bureau of Agricultural Economics; yearbooks of the U. S. Department of Agriculture; the Drover's Journal Yearbook; The Agricultural Situation, by Warren and Pearson, previously noted (E. S. R., 53, p. 795); and other Federal, State, and private publications. Most of the data are presented graphically. The common Pearsonian coefficient of simple correlation was used in determining the relationships of the various factors to hog prices.

The secular trend of hog prices from 1869 to 1914 (1914–1925 omitted because of unusual price movements) showed two movements, one downward from 1869 to 1896, averaging 3.45 cts. per 100 lbs. per year, and one upward from 1897 to 1914, averaging 25.7 cts. per 100 lbs. per year. The prices from 1878 to 1914, with the secular trend and the seasonal variations removed, showed a series of major cycles with minor cycles alternating, the crests of the major cycles being in the summer of 1882, early in 1893, in the summer of 1902, and in the winter of 1910, and those of the minor cycles being in the summer of 1888, the winter of 1906–7, and the fall of 1912. The low points occurred in December, 1878, October, 1885, July, 1890, September, 1896, March, 1905, February, 1908, and May, 1911. The index of seasonal prices at Chicago, 1878–1896, showed an increase from 97 in January to 106 in August, with a drop from 103 in April to 99 in May and June, and a decline from 105 in September to 93 in December. The index for 1897–1914 showed an increase from 95 in January to 105 in April, a drop to 100 in June, an increase to 102 in July, August, and September, and a drop to 91 in December. The inverse relationship between the monthly receipts and prices is marked in both periods.

Measuring the relationship between daily receipts and daily prices at Chicago for 1923 and 1924, using the average percentages of daily receipts based upon weekly total receipts, 1922–1925, as a normal distribution, gave a correlation coefficient of -0.2616 ± 0.0255. The correlation coefficient of the relationship between weekly receipts and prices at Chicago, 1920–1925, measuring such receipts and prices from their respective weekly seasonal norms, was found to be -0.0040 ± 0.0395. Measuring the relationship between monthly receipts and prices, the correlation coefficient was -0.2441 ± 0.0420 for the period 1878–1896 and -0.4853 ± 0.0360 for the period 1897–1914.

Coefficients were computed for the relationship between the various pork products during the period from May 1, 1920, to January, 1924, and for the relationship between different pork products and hog prices, using different lags for each. A pork product index was constructed, using the following products and weights: Pork loins 1, breakfast bacon 1, smoked hams 2, and pure lard 1. This index, correlated with hog prices with no lag for either, gave a coefficient of $+0.9081\pm0.0073$.

A table is given showing the standard deviations from 1921 to 1924, inclusive, of hog price differentials by grades between Chicago and Omaha, Kansas City, East St. Louis, South St. Paul, Buffalo, and Pittsburgh. These varied from 18.5 at Omaha to 26.6 at Pittsburgh for heavy weight, from 12 at East St. Louis to 29.6 at Pittsburgh for medium weight, and from 15.8 at South St. Paul to 27.2 at Kansas City for light weight. A table is also given showing the percentages of variation of receipts, shipments, and slaughter, 1920–1925, at Chicago, Omaha, Kansas City, East St. Louis, and South St. Paul. These varied from 30 at Chicago to 47 per cent at South St. Paul for receipts, from 32 at East St.

Louis to 68 per cent at South St. Paul for shipments, and from 32 at Chicago to 44 per cent at South St. Paul for slaughter.

The monthly corn-hog ratio for Iowa from 1910 to 1925, inclusive, was found to have varied from 6.9 for July, 1924, to 25.1 for February, 1922, averaging 13.2 for the 16 years.

An appendix gives lists of sources of periodical statistical data on hogs and hog products and of references to assembled series of hog statistics.

The milk supply of Massachusetts, R. J. McFall (*Massachusetts Sta. Bul. 236 (1927), pp. 121–131, fig. 1*).—Tables are given showing the quantities of milk and cream used in Massachusetts annually, the sources of supply, the percentage of different feeds used in producing milk and the net thermal equivalent of each per 100 lbs. of all grain in the several New England States, and the feed units, home-grown and shipped in, used per 100 lbs. of milk produced in the several States.

A study was also made of the consumption and sources of supply in Springfield and the surrounding area from which commuters come regularly to Springfield and which the city retail distributors serve. The data show that 59.4 per cent of the milk used was produced within the State and 43.1 per cent imported from the North and Connecticut (2.5 per cent exported to Rhode Island and New York); and that 100 per cent of the cream used was imported; that the average daily per capita consumption in Springfield and vicinity was 0.39 qt. of milk and 0.015 qt. of cream; and that the total percentage of feed units home-grown was 69.52.

A price differential for whole milk, W. L. Gaines (*Illinois Sta. Circ. 318 (1927), pp. 8, fig. 1*).—A circular for popular use, setting forth the results of research, previously noted (E. S. R., 52, p. 878), that the relative feed cost of producing milk is proportional to the percentage of butterfat plus 2.86. A table is given showing the price differential proportional to feed cost differential for base fat percentages of 3, 3.5, and 4 and base prices per 100 lbs. of from $1 to $3.90. Some data from Danish experiments supporting the feed cost formula are included.

Prices of farm products received by producers, II–IV, (*U. S. Dept. Agr., Statis. Buls. 15 (1927), pp. [2]+203, fig. 1; 16, pp. 3+241, fig. 1; 17, pp. [2]+152, fig. 1*).—These complete the series previously noted (E. S. R., 56, p. 888). No. 15 covers Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas; No. 16 covers Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas; and No. 17 covers Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

Tables similar to those in the previous bulletin are given, with the following exceptions: December 1 farm price of crops tables begin with West Virginia and Minnesota 1867, North Dakota and South Dakota 1882, Oklahoma 1894, California 1868, Oregon 1869, Nevada 1870, Colorado 1880, and other States in Bulletin 17, 1882; January 1 farm values of livestock per head tables begin with West Virginia 1868, North Dakota and South Dakota 1883, Oklahoma 1894, California 1869, Oregon 1870, Nevada 1871, Colorado 1878, and the other States in Bulletin 17, 1883; and the tables for wages of hired farm labor begin with Oklahoma, 1893; Idaho, Wyoming, and Arizona, 1887 or 1888; and Montana, 1880 or 1881.

Income to Iowa Agriculture, 1920 to 1926, K. Bjorka (*Iowa Sta. Circ. 104 (1927), pp. 8, fig. 1*).—The index of gross income (1920=100) from hogs, cattle, sheep, corn, oats, wheat, barley, butter and other dairy products, eggs,

and poultry in Iowa was 100, 62, 68, 78, 80, 84, and 92, respectively, for the years 1920–1926, and the index of purchasing power of farm products in terms of nonagricultural commodities (average 1910–1914=100) was 78, 62, 68, 67, 75, 89, and 87, respectively.

The income figures used were based upon State, Federal, and terminal livestock market reports, and so far as possible include only the income from the portion of the commodities sold off the farm. It is estimated that the 10 commodities considered include about 95 per cent of the total income from agriculture in the State. Of the average income for the seven years, about 38 per cent was from hogs, 21 from cattle, 14 from butter and other dairy products, 13 from corn, 6 from eggs and poultry, 5 from oats, and about 2 per cent from barley, wheat, and sheep combined. In 1926, 43 per cent of the gross income was from hogs, 15 from dairy products, 1 from corn, and 4 per cent from oats.

South Dakota farm production and prices, O. L. DAWSON (*South Dakota Sta. Bul. 225 (1927), pp. 111, figs. 23*).—This statistical bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, gives annual summaries by counties of the acreage, yield per acre, and production of the various crops in 1925 and 1926; the number of different kinds of livestock on farms, January 1, 1926 and 1927; land values, 1910, 1920, and 1925; value of crops, livestock, and livestock products, 1924; yields of different crops by years, 1916–1924; and shipments of different kinds of livestock, 1923–1925. Numerous other tables are included for the State and the United States showing for periods of various lengths data as to farm production, prices, wages, land values, farm income, etc.

[Crops and livestock production on the Belle Fourche (S. Dak.) reclamation project, 1913–1925], B. AUNE (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 6, 7*).—The acreage of the principal crops and the numbers of different kinds of livestock, 1913–1925, and the carload shipments of livestock from different shipping points, 1916–1925, are tabulated.

What farmers think of farming, W. F. KUMLIEN (*South Dakota Sta. Bul. 223 (1927), pp. 31, figs. 9*).—This bulletin reports a study made of the farm families in Orland and Clarno Townships, Lake Co., S. Dak. The data for all of the 150 families, with the exception of 5, were obtained in personal interviews by the author with the farmer, his wife, and older children. Data were obtained as to age, place of birth, nationality, marital condition, education, church affiliation and attendance, membership in other organizations, etc., of the farmer and his wife, size of family, type of farming, land owned and rented, marketing, income, home conveniences and surroundings, reading matter, recreation, attitude of parents and children toward farming, satisfaction with local government, schools, and different organizations, community relationships, etc. Data were also obtained from county, State, and Federal records as to taxation, mortgage indebtedness, population, etc. Of the population of the two townships, 25.3 per cent were foreign born and 35.4 per cent were natives of South Dakota, 89.3 per cent were born or brought up on farms, and 52.6 per cent of the farmers and their wives had lived in town from 1 to 20 years.

Eighty-seven per cent of the farmers and their families expressed themselves as satisfied with the farm as a home and as a mode of living, and very little dissatisfaction was expressed against any of the existing community services. Seventy-eight per cent of the farmers stated that they would farm if starting again, 93 per cent wanted their sons to farm, 82 per cent were making special efforts to keep their children on the farm, and none objected to their daughters marrying farmers. Of the children 79.9 per cent of

those over 21 years of age were farming and 89.2 per cent of the younger boys expressed a desire to farm.

Rural social organization in Whatcom County, E. A. TAYLOR and F. R. YODER (*Washington Col. Sta. Bul. 215 (1927), pp. 53, figs. 9*).—This bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is based upon facts obtained from 875 farm families and from leaders in towns and villages. Practically all of the data were gathered during the summer of 1926. The agriculture of Whatcom County is quite diversified, hay and forage crop raising and dairying being of chief importance in the river bottom sections, and poultry raising and fruit, berry, and vegetable growing in the upland regions. About 25 per cent of the population of the county is foreign born, and 87 per cent of the farms are operated by owners.

In the study made 44 neighborhoods were located, of which 40 were open country and 4 town-country neighborhoods. Of the farmers visited, only 91 classed themselves as belonging to no neighborhood. The intensity of group consciousness was classified by the authors as high in 10, medium in 21, and low in 13 of the neighborhoods studied. The activities found in the neighborhoods were school 38, church 21, grange 9, store 8, home economics clubs 16, 4-H clubs 7, natural phenomena 8, newspaper identity 28, town-country neighborhood 4, and community building, garage, resort center, and former village each 1.

The number of services in the neighborhoods varied from 1 to 8. Forty-nine distinct services rendered by the town and village service centers in the area studied are listed, the 7 service centers rendering from 13 to 77 services each. The town service centers and the farmers' cooperative organizations of Whatcom County are described. It was found that on the whole, the farm people of the county are enjoying the benefits of well organized rural life, especially as regards their business activities, and that the next steps will be to bring the organization of their educational, religious, and social interests to a similar level of efficiency.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A forest fire prevention handbook for the schools of New Mexico (*U. S. Dept. Agr., Misc. Circ. 89 (1927), pp. II+18, figs. 14*).—This circular, prepared by the Forest Service in cooperation with the superintendent of public instruction of New Mexico, contains a lesson each on the forests of the State, effects of forest fires, causes of fires, fire prevention, and how forest fires are discovered and put out.

FOODS—HUMAN NUTRITION

Compendium on dietetics and nutritional diseases in the child and in the adult, G. MOURIQUAND (*Précis de Diététique et des Maladies de la Nutrition chez l'Enfant et chez l'Adulte. Paris: Octave Doin, 1926, pp. II+817, pls. 3, figs. 60*).—This reference book, based upon lectures given to the Faculty of Medicine, Lyons, France, consists of three parts, dealing, respectively, with the dietetics of children and adults in health and disease, diseases of food origin, and nutritional diseases. The discussion of the various food and nutritional disorders includes symptoms, etiology, and treatment, with particular emphasis on diet.

Physiology and biochemistry in modern medicine, J. J. R. MACLEOD ET AL. (*St. Louis: C. V. Mosby Co., 1926, 5. ed., pp. XXXII+1054, pls. 9, figs. 232*).—Attention is called to the fact that in the present revision of this well-known handbook, an earlier edition of which has been noted (E. S. R., 45, p. 578), the

section on carbohydrate metabolism has been rewritten to bring the subject matter in line with recent advances.

Manual for meal planning and preparation clubs, G. B. ARMSTRONG and N. VASOLD (*Illinois Sta. Circ. 312 (1927), pp. 47, figs. 8*).—This manual, which has been compiled chiefly for girls' club members, consists of three sections dealing, respectively, with meal planning, food preparation, and table service and etiquette.

The thirty-first report on food products and the nineteenth report on drug products, 1926, I, II, E. M. BAILEY (*Connecticut State Sta. Buls. 286 (1927), pp. 285–357+VII; 287, pp. 359–391*).—In part 1 of this annual report have been assembled, particularly for the benefit of diabetic patients, analyses of common foods and of well-known brands of manufactured foods formerly known as diabetic foods, miscellaneous products, and canned fruits and vegetables. The analyses in the table of common foods are taken largely from Bulletin 28, Office of Experiment Stations (E. S. R., 11, p. 379), but include some from various bulletins of the station and from other sources. The analyses of special foods are taken from Bulletin 220 (E. S. R., 43, p. 861), with hitherto unpublished analyses made up to and including 1926. Attention is called to U. S. Department of Agriculture Food Inspection Decision 199 revoking the term diabetic food. Part 2 contains the routine analyses of various food products and drugs (E. S. R., 55, p. 385).

Foods and drugs, J. M. BARTLETT (*Maine Sta. Off. Insp. 123 (1927), pp. 16*).—This is the annual tabulation of the results of the examination of food and drug samples collected by the inspectors of the division of inspections of the State department of agriculture (E. S. R., 56, p. 86).

Good bread from Illinois soft-wheat flours, R. A. WARDALL and N. K. FITCH (*Illinois Sta. Circ. 317 (1927), pp. 12, fig. 1*).—In this preliminary report of an investigation of the baking qualities of Illinois soft-wheat flours, directions are given for modifications in the usual procedure for making bread from hard-wheat flours which have been found to improve the quality of bread from soft wheat. These include changes in the proportion of the ingredients, length of fermentation period, and manipulation of the dough. Recipes are given for short process and long process bread, Parkerhouse and luncheon rolls, and coffee bread. The characteristics of good bread are outlined, with a score card for judging the various characteristics.

Asparagus, A. W. BITTING (*Canning Trade, 49 [i. e. 50] (1926), Nos. 14, pp. 16, 18, 20; 15, pp. 12, 14, 16; 16, pp. 12, 14, 16; 17, pp. 12, 14, 16; 18, pp. 12, 14, 16*).—Although this series of papers deals chiefly with commercial methods of canning asparagus, interesting historical information is given on its cultivation and preparation for the table, including French and English recipes of the sixteenth and seventeenth centuries.

The discoloration of canned cranberries, F. W. MORSE (*Jour. Agr. Research [U. S.], 34 (1927), No. 9, pp. 889–892*).—In this investigation at the Massachusetts Experiment Station, the frequent discoloration of cranberry sauce preserved in lacquered tin cans was traced to the reaction of the coloring matter in the cranberry with iron dissolved from the inner surface of the can along the seams.

The evidence was obtained in preliminary studies by spreading cranberry sauce in glass dishes and adding to the surface a variety of soluble compounds of aluminum and of iron. No color change occurred with the aluminum compounds, but perceptible darkening with the iron. The pigment from Early Black cranberries was isolated by the method of Willstaetter and a solution of the hydrochloride of the pigment tested with various iron salts and alumi-

num salts. Again there was no color change with the aluminum, but removal of the color from the pigment solution and formation of a colored precipitate with the iron salts. Sauce which had become discolored with corrosion of the can was found to have a much higher content of iron than sauce which had not been discolored. An acetic acid extract of pigment prepared from freshly crushed fruit acted very readily with a piece of iron wire, with the formation of a precipitate, but had no effect on aluminum.

Fruit jellies.—V, The rôle of pectin.—1, The viscosity and jellying properties of pectin solutions, P. B. Myers and G. L. Baker (*Delaware Sta. Bul. 149 (1927), pp. 46, figs. 13*).—In this continuation of the series of studies previously noted (E. S. R., 55, p. 385) data are presented in support of the contention that the jellying power of a pectin solution may be expressed by its viscosity.

The effect of variations in H-ion concentration on the viscosity of pectin solutions at room temperature was first determined. The addition of either an acid or an alkali caused a drop in the viscosity of the pectin solution, but the change was much more marked with alkali than with acid. The maximum viscosity of a pectin solution thus occurs at the initial H-ion concentration of the solution.

On increasing the concentration of a pectin solution, the viscosity of the solution increased rapidly, as did also the jelly strength. This would indicate that the higher the viscosity the greater the amount of sugar necessary to maintain a constant desirable strength of the jelly. This was demonstrated by making jellies with pectin solutions of varying viscosities and varying amounts of sugar.

The effect of variations in the quality of the pectin on the viscosity of the solution and its subsequent effect on jelly strength were next studied. The variations in quality were brought about by boiling the pectin solution for different periods of time at constant acidity. The solutions thus obtained were clarified with Filter-Cel, precipitated with 85 per cent alcohol, washed with 95 per cent alcohol and ether, and dried at 60° C. for 25 hours. A series of jellies was prepared with each pectin solution, varying only the acidity. Determinations were also made of the pectic acid by the Wichmann method (E. S. R., 51, p. 205) and of ash, as well as of the viscosity of the pectin solution. The viscosity was found to decrease rapidly as the time of boiling the solution increased, other factors remaining constant, and to decrease slightly as the H-ion concentration was increased, the time of boiling and other factors remaining constant. The percentage of pectic acid, as determined by the Wichmann method, did not indicate the jellying power of the pectin. Both this and the calcium pectate method are criticized as estimating decomposition products as well as pectin.

Other factors found to affect the viscosity of pectin solutions were the method of precipitating the pectin with alcohol, the temperature of drying, and the time of standing at different temperatures. The method suggested by Griggs and Johnstin (E. S. R., 55, p. 801) of adding the alcohol drop-wise to the pectin solution was found to be the most satisfactory. Temperatures above 60° and prolonged drying were found to decrease the viscosity.

A method for the preparation of a high quality pectin, based upon the various observations noted, is outlined.

The great value of meat in the diet, B. K. Whipple (*Missouri Sta. Circ. 156 (1927), pp. 4*).—A nontechnical discussion of the nutritive needs of the body and the value of meat in satisfying these needs.

The relation of the connective tissue content of meat to its protein value in nutrition, H. H. Mitchell, J. R. Beadles, and J. H. Kruger (*Jour. Biol. Chem.*, *73* (*1927*), *No. 2*, *pp. 767–774*).—Previous circumstantial evidence that the more fibrous a cut of meat the lower the biological value of its protein has been confirmed by the results obtained in a comparison of the value of the nitrogen of (1) a cut of meat of low connective tissue (pork tenderloin), (2) a sample of connective tissue itself (pork cracklings), and (3) definite mixtures of the two, such as would be found in the less desirable cuts of meats.

The biological value of the nitrogen of pork tenderloin was found to be 79, that of the cracklings 25, and of a mixture of the two in the proportion of 3 parts of tenderloin nitrogen to 1 of crackling nitrogen 72. This value of the mixture was, however, somewhat higher than the calculated value on the assumption of no supplementary relationship between the two.

Attention is called to the fact that the various cuts of pork do not differ greatly in their content of connective tissue, while those of veal and beef vary widely, the cheaper cuts containing a much higher amount than the more expensive cuts. Similar variations have been found in the biological values of the nitrogen of the different cuts.

Tests for incipient putrefaction of meat, R. H. Weaver (*Michigan Sta. Tech. Bul. 79* (*1927*), *pp. 28*).—Various tests which have been proposed for detecting incipient putrefaction in meat are discussed under the headings bacterial count, chemical tests, biological tests, and organisms concerned in putrefaction. Of the various methods, the biological test, or determination of the physiological activity of the organisms present, was selected for investigation. Fresh hamburg steak and similar meat after storage for two days at a temperature of 20° C. were ground in sterile sand according to the method of Weinzirl and Newton (E. S. R., 31, p. 854), the organisms plated on meat infusion agar, and transplants made of the colonies obtained. The cultures were examined microscopically and tested for hydrogen sulfide, ammonia, glucose-acid and glucose-gas production, reduction of methylene blue and nitrate, and production of indol.

Of the 51 cultures isolated from the fresh meat, 45 were coccus forms and 2 proteus-like rods, while of the 62 cultures isolated from meat in the beginning stages of putrefaction, only 13 were cocci and 32 were proteus-like rods. A larger percentage of the organisms isolated from the fresh meat than from the meat in the process of putrefaction reduced methylene blue and nitrate and produced ammonia. Indol was not produced by any organism in the first series, but by 28 per cent of those of the second series. Hydrogen sulfide was produced by 51 per cent of the organisms in the first and 81 per cent in the second series. A further difference in hydrogen sulfide formation was noted in that the gas was produced much more rapidly in the second than in the first series.

On the basis of these observations, attempts were made to develop tests for detecting the stage of incipient putrefaction and the amount of contamination by the time of appearance of indol and of hydrogen sulfide. The results with indol were unsatisfactory, but a satisfactory hydrogen sulfide method was developed, the directions for which are as follows: "Place 1 gm. of meat in a tube containing exactly 10 cc. of standard infusion or extract broth. Suspend a strip of lead acetate paper beside the cotton plug. Incubate at 37° in an anaerobic jar under partial vacuum. Examine and record the number of hours necessary to obtain blackening of the acetate paper due to the production of hydrogen sulfide." Positive tests were obtained from comparatively good hamburg steak in from 7 to 10 hours and from a steak in which a foul odor was apparent in from 2 to 5 hours. It is considered that hamburg steak which

does not give a positive test in 6 hours will keep at least 3 days in a good refrigerator. The test is thought to be efficient in showing not only the first steps in putrefaction but also the amount of effective contamination, and to have the advantage of being not extremely sensitive to errors in the preparation of the sample, method of sampling, or reaction of the broth employed as a medium.

A list of 41 references to the literature is appended.

Physical curd character of milk and its probable relation to infant nutrition, R. L. Hill (*Utah Sta. Circ. 66 (1927), pp. 4, figs. 4*).—A simple household test for determining whether a sample of cow's milk is suitable for infant feeding as far as the nature of the curd is concerned is described and illustrated, and conclusions as to the factors affecting the nature of the curd in cow's milk are summarized. The test differs from the more accurate one previously described (E. S. R., 51, p. 379) in that the hardness and texture of the curd are determined by squeezing the curd through cheesecloth. The curd from soft-curded milk suitable for infants passes readily through the cheesecloth, while that from hard-curded milk forms a hard ball.

The tallest American boys, H. Gray and S. T. Nicholson (*Jour. Amer. Med. Assoc., 88 (1927), No. 26, p. 2022-2024, figs. 2*).—Further proof that American private school boys are taller than boys of other classes is given in a statistical analysis of data previously reported by the authors for private school boys (E. S. R., 56, p. 394) and by Baldwin for California gifted children, and a comparison of these data with hitherto unpublished observations of Holt on 350 boys in a private school in New York City, of Faber on San Francisco public school boys, and of Benedict and Talbot on 886 boys from eight New England private schools. The boarders exceeded the public school boys in height at varying ages by from 3.1 to 10.6 cm. (2.1 to 6.6 per cent), with a general average of 6.6 cm. (4.7 per cent).

On the existence of two active factors in the vitamin B complex, W. D. Salmon (*Jour. Biol. Chem., 73 (1927), No. 2, pp. 483-497, figs. 2*).—Seeds of Mammoth Yellow soy beans and the Early Speckled velvet beans and leaves of the same variety of velvet beans and of the Dwarf Essex rape were tested for their antineuritic and growth-promoting properties on pigeons and young rats. The technique for the pigeon tests has been described elsewhere (E. S. R., 54, p. 90).

In the rat tests the basal diet was fed for two weeks before the feeding of the material to be tested was begun. In the pigeon tests the material to be tested was forced into the crop just before the feeding of the basal ration, and in the rat tests it was fed separately from the basal ration, which was generally placed before the rats only during the late afternoon and night.

Pigeons weighing from 300 to 370 gm. were completely protected by from 2.4 to 2.7 gm. of velvet beans or soy beans per day, while the same amount of the dried leaves of the velvet bean or rape led to the rapid development of polyneuritis. From 3.4 to 4 gm. of the leaves was required for definite protective action. Rats receiving from 0.1 to 0.15 gm. of the rape leaves lived only half as long as those receiving the same amount of soy beans. Those receiving 0.25 gm. of velvet bean leaves per day lived less than half as long as those on 0.1 gm. of soy beans and less than one-third as long as those on 0.2 gm. of soy beans per day. A combination of 0.1 gm. of soy beans or velvet beans and the same amount of rape leaves was more efficient than a corresponding amount of the rape alone, but not as efficient as 0.2 gm. of soy beans.

Practically all of the rats fed 0.25 gm. or less of the leafy materials per day developed severe cases of polyneuritis, while the negative controls and those

receiving seeds rarely developed such symptoms. Those on small allowances of seeds showed a tendency to lose their fur in patches and in a few cases to develop an inflammation of the eye.

In growth-promoting action for rats the leaves were superior to the seeds. Rats receiving 1 or 2 gm. of rape leaves grew more rapidly than litter mates receiving the same amount of soy beans. A daily intake or 1.65 gm. of dried velvet bean leaves resulted in more than twice the growth produced by 1.85 gm. of the seed. These demonstrations that the seeds are more potent than the leaves in antineuritic value for both pigeons and rats, while the leaves have a greater growth-promoting action than the seeds, are considered to indicate that "vitamin B is a complex consisting of at least two factors, the proportions of which may vary in the seeds and leaves."

In an effort to separate these factors, three preparations of varying concentration of the fraction adsorbed by fuller's earth (activated solid) were obtained from dried velvet beans and two from extracts of velvet bean leaves. These, with the residue obtained from the filtrate of the velvet bean leaves after the removal of the activated solids, were tested on pigeons and rats. The extracts from the activated solids protected pigeons and rats against polyneuritis, those from the seeds being effective in much lower concentrations than those from the leaves. The residue from the activated solid prepared from the leaves was without antineuritic properties. None of the extracts alone promoted growth in the rat, but the extract of the residue from the leaves combined with the activated fuller's earth fraction had marked growth-promoting action. These results confirm those of the first part of the study in indicating that vitamin B is a complex, and also the conclusions of Goldberger et al. (E. S. R., 55, p. 890) and of Smith and Hendrick (E. S. R., 55, p. 891) that neither of these factors alone suffices for growth but that a combination of the two is necessary. The seeds tested were apparently much richer in the first of these factors and the leaves in the second.

Conforming to Goldberger's proposal of P-P for the pellagra-preventing factor, which may or may not be identical with the second of the above factors, the author suggests the term B-P for the beriberi or polyneuritis-preventing factor, reserving the name vitamin B for the complex.

Gastric motility in vitamin B deficiency in the dog, E. A. Smith (*Amer. Jour. Physiol., 80 (1927), No. 3, pp. 485–487, fig. 1*).—Contrary to the results reported by Cowgill et al. (E. S. R., 56, p. 795) in a similar study, the author reports that dogs which have lost their appetite for vitamin B-deficient diets and are in the initial stages of beriberi have normal types of gastric hunger peristalsis.

The synthesis of vitamin E by plants grown in culture solutions, H. M. Evans and D. R. Hoagland (*Amer. Jour. Physiol., 80 (1927), No. 3, pp. 702–704*).—Etiolated and green seedlings of the Canadian field pea grown in an inorganic culture solution and also green seedlings grown in a solution of high sodium chloride content have been demonstrated to contain vitamin E.

The effects of dietary deficiencies on the growth of certain body systems and organs, J. C. Winters, A. H. Smith, and L. B. Mendel (*Amer. Jour. Physiol., 80 (1927), No. 3, pp. 576–593*).—Four groups of 25 young rats each were kept at stationary body weight for a period of 40 days by diets deficient in calories, total protein, lysine (gliadin), and salts, respectively. At the end of the period the rats were dissected and measurements made of the skeleton, brain, heart, liver, and testes. The data thus obtained were compared with similar data for normal rats of the same body weight and for rats allowed to grow normally during a like period of time.

Persistent skeletal growth occurred on all the diets used, amounting in body length to from 8.7 to 19.5 per cent of the normal gain. The increase was greatest on the lysine-deficient and least on the low salt diet. The weights of the leg bones stunted on the low calorie, low protein, and low lysine diets were 50 to 60 per cent above, and those of the rats stunted on the low salt diets 30 to 40 per cent below, those of the rats stunted in other ways. In no instance was there a decrease in the weight of any of the organs. The most significant change in organ weight was thought to be a marked and consistent increase in kidney weight, amounting to 55 per cent of the estimated weight at the beginning and 63 per cent of the normal weight on the low salt diet. There were also increases in the liver weight on the low salt and low protein diets in the testes on the gliadin ration and in the heart on the low protein diet. The effects of low protein and gliadin stunting differed in all of the comparisons made. The effects of the ration low in salts on organ weight were in general similar to those reported by Jackson and Carleton for rats with incipient rickets (E. S. R., 50, p. 566).

Botulism in the Union of Socialist Soviet Republics, S. I. Zlatogoroff and M. N. Soloviev (*Jour. Amer. Med. Assoc., 88 (1927), No. 26, pp. 2024, 2025*).—According to a summary of reported cases of botulism in Russia since 1881 there have been 12 outbreaks, with 52 cases of poisoning and 35 deaths. All of these outbreaks have been attributed to salt, smoked, or dried fish, which is used without cooking. Although the evidence in the earlier outbreaks can not be considered conclusive, the more recent ones have been diagnosed clinically and by bacteriological tests on laboratory animals. It is considered that the toxin can remain in contaminated fish for long periods, but that it is destroyed by putrefaction and by heating above 50° C.

Zinc toxicity, V. G. Heller (*Oklahoma Sta. Bien. Rpt. 1925–26, p. 16*).—In this progress report of an investigation of possible harm in using galvanized iron tanks for the storage of buttermilk, it is noted that the zinc content of buttermilk increases with length of storage in such vats and with the acidity of the buttermilk, but that feeding experiments conducted on rats indicate that buttermilk which has been in contact with zinc for some time is not toxic. The feeding has been carried through several generations with no deleterious effects. The work is being extended to the study of the effect of larger amounts of zinc. "It is evident that the fear of zinc poisoning has been overemphasized, and the so-called zinc poison effects were probably due to lead which is usually present in most zinc coatings."

TEXTILES AND CLOTHING

A new method for the determination of the fineness of wool and of the fleece, J. A. F. Roberts (*Jour. Textile Inst., 18 (1927), No. 1, pp. T48–T54*).—The method outlined results in the determination of a weight-length ratio, this quantity being estimated as the number of centimeters of fiber per milligram.

The action of sunlight on undyed and dyed wool fibers [trans. title], P. Krais and K. Biltz (*Leipzig. Monatschr. Textil Indus., 40 (1925), No. 8, pp. 305, 306; abs. in Jour. Textile Inst., 17 (1926), No. 7, p. A202*).—After exposure of single hairs from tops undyed and dyed with indigo and afterchromed or otherwise treated the tensile strength of fine fibers was found to remain fairly constant, although a marked decrease occurs in extensibility. This decrease is greater for undyed than for dyed fiber, affording further evidence of the protec-

A note on the chemical decomposition of wool at 100° C., J. L. RAYNES (*Jour. Textile Inst.*, *18* (*1927*), *No. 1*, *pp. T46*, *T47*, *fig. 1*).—Tests at University College, Nottingham, gave evidence that "dry" or initially moistened wool in the total absence of alkalies is not appreciably decomposed when heated in a current of dry air at 100°, whereas moist wool, even if neutral, seems to be badly attacked by heating at 100° under such conditions that the moisture is retained. When similarly treated, slightly alkaline wool such as is obtained by ordinary scouring methods is partially hydrolyzed with evolution of ammonia, the action being much more considerable if the wool be moist. Even cold water seemed to cause a very slight hydrolysis of the wool fibers.

Some methods of studying cord tire fabric, F. W. STAVELY and N. A. SHEPARD (*Indus. and Engin. Chem.*, *19* (*1927*), *No. 2*, *pp. 296–301*, *figs. 11*).—Hysteresis and flexing as fatigue tests for tire cords, factors influencing flexing, and the effects of impregnation on fatigue are discussed, with appropriate examples.

According to data cited, hysteresis loss shows that the original properties of the cord are not maintained. The flexing test subjects the cord to repeated stresses, and in the event of cord fabric failure in tire service is of value as a means of determining the desirability of changes in cord construction and in developing methods of improving the flexing life of a given type of cord. The flexing life of a given cord may be improved by impregnation with rubber cements containing compounding and vulcanizing ingredients. Road tests indicated that in the event of fabric failure the mileage of certain tires can be increased by prolonging the flexing life of the fabric.

The use of hydrocyanic acid gas for the fumigation of American cotton on import into India, A. J. TURNER and D. L. SEN (*Agr. Jour. India*, *22* (*1927*), *No. 3*, *pp. 173–175*).—During experiments under the auspices of the technological laboratory of the Indian Central Cotton Committee the authors observed that cotton loose or baled and dry or damp absorbs HCN. Damp cotton is rather more absorbent than dry cotton, although the difference even for extremes of humidity does not exceed 50 per cent of the total absorption. Within the limits, 86 to 104° F., the actual temperature affected very little the rate or degree of absorption of HCN by cotton. Absorbed HCN is desorbed fairly rapidly and completely, and no evidence of occurrence of any irreversible chemical combination appeared. With water present in the cyanide-acid reaction the weight of sodium cyanide required for satisfactory fumigation is about 0.05 per cent of the weight of the cotton. Experience on a practical scale showed that 1 lb. of sodium cyanide suffices for the satisfactory fumigation of about 5 bales of cotton under good conditions.

Jute appeared to have about twice the absorptive power of cotton and moreover absorbed the HCN more rapidly. Its absorptive power depends to only a small extent on its moisture content, although slightly greater for damp jute than for dry, and remains practically unchanged through the range 86 to 104°.

[Report of the Linen Industry Research Association, 1926] (*Linen Indus. Research Assoc. [Lambeg, Co. Antrim], Rpt. Council, 1926, pp. 24, pl. 1*).—Flax investigations reported on briefly from the research institute at Lambeg in northern Ireland include agronomic and breeding studies and retting, spinning, weaving, bleaching, and dyeing tests.

Further experiments to determine the degree of breakdown of fiber strands during wet spinning showed conclusively that the reach of the spinning frame is a limiting factor in the length of fiber strand to be found in the yarn, although only a small percentage of fiber strands in a wet-spun yarn exceed

the reach of the spinning frame. The softening of the gummy matter and pectic materials does not seem of such predominant importance as has been thought. Tests of the effect of the thickness of the straw on subsequent preparing and spinning behavior of the fiber showed quite definitely that the fiber strands from fine straw are finer originally and remain finer throughout the process of manufacture into yarn. Moreover, the finer straws spin to the highest lea.

Investigation of the conservation in weight in bleaching has developed a practical process wherein the loss in weight in bleaching is less than half that produced by normal bleaches. While the bleached cloth is not a perfect full white, the color suffices to meet numerous requirements. Laundry experiments demonstrated that the excess weight in materials bleached to conserve weight is well maintained even after prolonged washing. The loss in weight in laundry operations appeared largely due to mechanical loss of fiber. The substances associated with the cellulose of the fiber upon the presence of which the possibility of conserving weight depends are in many respects similar to cellulose and may be retained in bleaching with advantage.

Acetate silk and its dyes, C. E. Mullin (*New York: D. Van Nostrand Co., 1927, pp. 473, figs. 13*).—The development, status, and general properties of the rayon known as acetate silk are detailed, with methods for identifying the several rayons, detecting mercerized cotton, and dyeing the older rayons. The greater portion of the work is concerned with the dyeing properties of acetate silk, preparation methods, dyes and their application to acetate silk alone and in combination with other fibers, dyeing troubles and faults, and the sizing and finishing of acetate silk. Abstracts of important patents involved in the various processes are also included.

A photographic method of investigating the colour of light sources and the reflecting power of coloured fabric and other surfaces, P. W. Cunliffe and F. D. Farrow (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 6 (1927), No. 7, pp. 77–88, pls. 2, figs. 6*).—"The present paper is to be regarded primarily as a description of a method which is being applied in current research on the action of light on dyed fabrics."

HOME MANAGEMENT AND EQUIPMENT

Selected list of Government publications on housing and equipment, compiled by R. Van Deman (*U. S. Dept. Agr., Bur. Home Econ., Home Econ. Bibliog. 2 (1927), pp. 15*).—An annotated list of 75 publications is given.

MISCELLANEOUS

Report of the Alaska Agricultural Experiment Stations, 1925, C. C. Georgeson (*Alaska Stas. Rpt. 1925, pp. [2]+41, figs. 9*).—This contains the organization list and a report of the several lines of work carried on. Meteorological data and accounts of the extensive tests with field and garden crops are abstracted elsewhere in this issue.

Annual Report of [Louisiana Stations], 1926, W. R. Dodson et al. (*Louisiana Stas. Rpt. 1926, pp. 123, figs. 5*).—This contains the organization list, a financial statement for the fiscal year ended December 31, 1926, and a report by the director, including brief departmental reports and meteorological data. The experimental work reported is for the most part abstracted elsewhere in this issue.

Biennial Report of the Missouri State Fruit Experiment Station, Mountain Grove, Mo., 1925–1926, F. W. Faurot (*Missouri Fruit Sta. Bien. Rpt. 1925–26, pp. 7*).—This contains a financial statement for the fiscal biennium

ended December 31, 1926, and a report of the director discussing the needs of the station during the ensuing biennium.

Fortieth Annual Report of [Nebraska Station, 1926] (*Nebraska Sta. Rpt. [1926], pp. 42*).—This contains the organization list, a report of the work of the station, and a financial statement for the fiscal year ended June 30, 1926. The experimental work not previously reported is for the most part abstracted elsewhere in this issue.

A report on investigations of farm problems: The Biennial Report of the Oklahoma Agricultural Experiment Station for 1924–1926, [C. T. DOWELL ET AL.] (*Oklahoma Sta. Bien. Rpt. 1925–26 pp. 62*).—This, a report of the station for the biennium ended June 30, 1926, contains a financial statement and a report of the director and the various departments. The experimental work reported is for the most part abstracted elsewhere in this issue.

Work of the Belle Fourche Field Station in 1923, 1924, and 1925, B. AUNE (*U. S. Dept. Agr., Dept. Circ. 417 (1927), pp. 36, figs. 4*).—The experimental work reported as carried on at this farm, located near Newell, S. Dak., is for the most part abstracted elsewhere in this issue. Meterological observations at the station are also included.

Publications of the U. S. Department of Agriculture, compiled by D. STOCKDALE (*U. S. Dept. Agr., Misc. Circ. 103 (1927), pp. 110*).—This contains a classified list of the available publications of the principal series issued by the Department. The several periodical publications are also described.

Summary of publications, B. C. PITTMAN (*Utah Sta. Circ. 68 (1927), pp. 8*).—This contains summaries of publications of the station issued since September, 1926, including abstracts of scientific and technical papers published outside the station series.

NOTES

New York State Station.—Among the special features of the extensive station exhibit at the recent State fair was a collection of about 25 ornamentals suitable for use in New York and arranged as a miniature landscape. This exhibit was presented jointly with the College of Agriculture of Cornell University and the State Department of Agriculture.

Another joint presentation by the station and the Department of Agriculture was a special corn borer exhibit, including control measures, a demonstration of the requirements under the new apple grading law, and illustrations of the work of the seed and fertilizer inspection service.

Discovery of the Mexican bean beetle in North Collins and Gowanda in western New York was announced in August by Rodney Cecil of the U. S. D. A. Bureau of Entomology, whose headquarters are at the station. The pest has now been found in Allegany, Cattaraugus, Chautauqua, Erie, Livingston, and Wyoming counties, the chief bean-growing counties of the State. The invasion so far is confined chiefly to a few plants in many widely scattered areas.

Virginia Truck Station.—The annual field day and farmers' picnic was held on the station grounds August 17, with an approximate attendance of 800 farmers and others. After inspecting the farm plats and station laboratories, addresses were given by John R. Hutcheson, director of extension work of the Virginia Polytechnic Institute, who stressed the value of cooperative movements and farm organizations, and B. T. Gunter, president of the Eastern Shore of Virginia Produce Exchange, who discussed the organization and functions of the quotation committee of the Farmers Association of Northampton and Accomac Counties. This body has proved of great assistance, disposing of approximately 20,000 cars of potatoes during the months of June and July.

Wisconsin University and Station.—An investigation of an unusual type of mineral deficiency occurring in dairy cattle in the Door Peninsula region in the eastern part of the State has been made during the past season. The disease is known as pica and has been reported in other States. Experiments have shown the cause to be a deficiency of phosphorus in the soils of the region and a corresponding low phosphorus content in the crops produced. Fertilizing the fields with a phosphate fertilizer not only increases crop yields, but also does away with the abnormal condition of the cattle fed the crops grown thereon. Supplying the cattle with feed rich in phosphorus has also produced markedly beneficial results, and has demonstrated conclusively that the disease can be easily prevented or cured provided adequate phosphorus is supplied in the ration.

Three years ago this station, in cooperation with the Wisconsin Utilities Association and agricultural organizations, started experimental work in rural electrification. A recent survey indicates that the number of electrically equipped farm homes in Wisconsin has doubled in the past four years.

William Noble Clark has been appointed assistant to the dean and director vice Walter H. Ebling, whose resignation has been previously noted.

Wyoming University and Station.—Recent appointments include in the university Marita Monroe as instructor in institutional management, vice Hazel Schrack, and in the station O. T. Bonnett as assistant agronomist and Carl S. Gilbert as assistant research chemist.

EXPERIMENT STATION RECORD

Vol. 57 | November, 1927 | No. 7

A notable event of the vacation season was the dedication by President Coolidge of the new Lincoln Memorial Library at the South Dakota College of Agriculture and Mechanic Arts. This ceremony, which took place on September 10, 1927, marked the completion of another important unit in the building program of this institution, adding materially to its physical equipment by a structure specifically designed for library purposes and provided with much modern equipment, constructed on a scale which is expected to meet not only the existing needs but those for many years to come, and ranking in both appearance and serviceability among the finest college libraries of this country.

The Lincoln Memorial Library received its name in recognition of the services of Abraham Lincoln in establishing the land-grant college system by his approval of the original Morrill Act of 1862. This action overcame the halting of this great enterprise by the veto of a similar measure by President Buchanan in 1857, and is said to have been the fulfillment of President Lincoln's only preelection promise. Rather surprisingly, it appears to be the first building on any land-grant college campus to be so named and dedicated. As the dedicatory program pointed out, "to him who was so fond of books, so eager for learning, and who probably more than any other American put to better practical use such education as he had, there could be no more fitting memorial than a beautiful library housing volumes of information for students on the campus of one of the colleges which his signature established."

It was most appropriate that the dedication address should be delivered by the Chief Executive of the Nation, and peculiarly so that this honor fell to President Coolidge, signer in 1925 of the Purnell Act, the latest supplementary Federal measure in the history of the land-grant college legislation. Recognition of this service of President Coolidge found expression during the exercises through the conferring upon him by the college of the degree of doctor of science, and subsequently in the laying by President and Mrs. Coolidge of a memorial stone of the Coolidge Sylvan Theater. This theater, a gift of the 1926 and 1927 graduating classes, occupies a natural basin immediately adjoining the library, and when com-

pleted will be the center of student outdoor activities, providing seating capacity for many thousands of people and furnishing a beautiful and unusual setting for outdoor plays and pageants, concerts, summer lectures, farm meetings, and similar gatherings.

The address of President Coolidge was a sympathetic utterance, recalling the interest of President Lincoln in agricultural education and discussing some of the important contributions to American life which the land-grant colleges have made. Particularly impressive, however, was his advocacy of what may be termed the cultural side of their work. "I can not conceive," he declared, "that the object of Abraham Lincoln was merely to instruct men how to raise more corn, to feed more hogs, to get more money, to buy more land, and so on in the expanding circle, as the story goes. Of course, he wanted to teach men to raise more corn, but his main object must have been to raise better men. We come back to the query that is contained in the concentrated wisdom of the ages, 'What shall it profit a man if he gain the whole world and lose his own soul?' All of our science and all of our arts will never be the means for the true advancement of our Nation, will never remove us from the sphere of the superficial and the cynical, will never give us a civilization and a culture of any worthy and lasting importance unless we are able to see in them the outward manifestation of a spiritual reality. . . .

"There is something more in learning and something more in life than a mere knowledge of science, a mere acquisition of wealth, a mere striving for place and power. Our colleges will fail in their duty to their students unless they are able to inspire them with a broader understanding of the spiritual meaning of science, of literature, and of the arts. . . . The human soul will always rebel at any attempt to confine it to the physical world. Its dwelling place is in the intellectual and moral world. It is into that realm that all true education should lead. Unless our scholarship, however brilliant, is to be barren and sterile, leading toward pessimism, more emphasis must be given to the development of our moral power. Our colleges must teach not only science but character. We must maintain a stronger, firmer grasp on the principle declared in the Psalms of David and reechoed in the Proverbs of his son, Solomon, that 'the fear of the Lord is the beginning of knowledge.'"

These conceptions have long been accepted by the leaders of agricultural education in this country of broadest vision and widest understanding, but not always by the general public. Far too seldom has their significance been appreciated by those who have visualized little beyond the immediate economic advancement of agriculture and the industries, and who would hold these colleges to the narrowest curricula of trade schools and measure their usefulness to society primarily by the number of farmers and artisans whom they train. The enunciation of their vastly broader mission which the President

of the United States has given is, therefore, both timely and important, and his message should be of great and abiding value in many quarters.

A recent report from the University of Nanking serves as a reminder that in the East as in the West progress is steadily being made in the training of agricultural leaders and the acquisition and application of scientific information in agriculture. The report referred to is the twelfth of the College of Agriculture and Forestry and the Experiment Station, and indicates in a striking way how this institution is developing in resources and in usefulness despite many handicaps and unpropitious circumstances.

The College of Agriculture and Forestry opened its doors to students in 1914. It was established as a direct outgrowth of famine relief work, and was organized by Mr. Joseph Bailie, its dean for several years, in an attempt to provide permanent prevention checks against famine by training leaders in agriculture and forestry and carrying on experimentation and extension work. Its early financial support was derived from the university itself, the Chinese Government, various missionary bodies, commercial organizations, and private individuals in China and elsewhere, but operations were on a relatively modest basis until 1923, when the sum of approximately $700,000, derived from the surplus remaining unexpended by the American Committee for China Famine Fund at the close of its relief campaign, was placed in trust for the use of the university "for the education of the Chinese in agriculture, forestry, and such other activities as may relate to famine." This status is to continue until 1933, when the grant will either be turned over to the university or, in the discretion of a duly appointed China Fund Committee, diverted to other channels for the purpose of famine prevention. The income from this fund has of late provided the principal revenues of the college and has enabled considerable expansion of personnel, equipment, and operations.

During the fiscal year 1926, the college had a faculty of over 50 persons in addition to numerous assistants and cooperators in its crop improvement program. Over half of its staff were graduates of the college, while about 20 held degrees from American institutions.

The number of students has increased materially, with 127 in the college degree course, 46 in a special short course, and 28 in the rural normal course. Graduate instruction is also formally organized, with a number of candidates for the degree of master of science in the groups of plant industry, biology, rural education, economics and sociology, and forestry.

Of the 110 graduates from the college, 62 of whom specialized in agriculture and the remainder in forestry, it is estimated that a little over 77 per cent are engaged in work directly relating to agriculture

and forestry, this including instruction, research, extension, supervision of practical agriculture and forestry projects, or rural social work. About 12 per cent are engaged in official life and business, and nearly 8 per cent are pursuing graduate study in China and abroad.

The physical equipment of the college has been greatly augmented by the recent completion of three new buildings. Bailie Hall, the college headquarters, is a three-story and basement structure of brick and concrete, with modern fixtures and appliances. It was erected at a cost of $100,000, half obtained from the American Famine Fund Committee, a quarter from the China Medical Board, and the remaining $25,000 from 12 individuals in the United States. A group of rural normal school buildings, including a rural practice school and children's gardens, and the new building at the Taiping Experiment Station accommodate a rural school, storage for seeds, farm implements, feeds, and other needed equipment for experimental work. There is also available a substantial two-story and basement sericultural building of brick and concrete, erected in 1923 at a cost of $21,000 by the members of the Silk Association of America as an expression of their interest in the improvement of sericulture in China.

The policy of the college is to cooperate wherever possible with other organizations on matters of mutual interest. Cooperative relations are being maintained with such bodies as the International Famine Relief Commission in the organization and administration of rural cooperative credit societies; the International Committee for the Improvement of Sericulture in China in the production and distribution of improved silkworm eggs; the Chinese Foreign Famine Relief Committee in a study of Hwai River watershed; the Mass Education Movement in rural survey work; the China National Christian Council and many other Christian bodies in China; and the United States National Museum in a cooperative plant exchange. One undertaking of special interest in this country is the triangular plant improvement project entered into in 1924 by the university, the plant breeding department of the New York State College of Agriculture at Cornell University, and the International Education Board. Under this arrangement, as projected, Cornell University details a staff member of its department of plant breeding each year for a period of five years, while the International Education Board and the University of Nanking contribute his salary and traveling expenses and maintenance. The usefulness of this work has been further enhanced by the holding of a Summer Institute of Crop Improvement at Nanking in 1926, and by extensive cooperation in a crop improvement program with nine other educational institutions. One result of this work has been the adoption of uniform plant breeding methods by a number of the most important experiment

stations, and, in the words of the report, "everything points to the cooperation proving a success and great benefit to the furtherance of crop improvement and the increase of food production in China."

In addition to the Summer Institute of Crop Improvement, a summer school for rural workers designed primarily for teachers and preachers has superseded the former university summer school. The 1926 season of this school brought together for a month's session a total of 224 students from 14 provinces and representing about 15 denominations. In February, 1926, there was also held a four-day conference of Christian rural leaders, attended by 217 out-of-town delegates of whom only 16 were foreigners. One result of such gatherings has been to stimulate an active and increasing interest among missionary organizations in agricultural education and research. The changing viewpoint is illustrated in the statement that "there is coming to be a strong public opinion which recognizes the peculiar needs of the rural church and sees the necessity for providing such special training as will bring Christian workers into closer contact with the life and thought, economic, social, and religious, of the rural masses and that will send students back into the country with a keener knowledge of the problems and with a training that will make it possible for them to serve the rural community in many practical ways."

The extension work of the college is organized as a distinct department and one which is functioning with much activity. It is reported that during the year extension field trips, arranged for the most part through mission and Chinese pastors, were made to 121 localities in 7 provinces and that approximately 111,280 people were present at the various programs. The audiences varied, we are told, from "college and university students down through the middle school, primary school, and country school students and from the merchant and gentry classes in the country to the illiterate, but nevertheless in their own ways, wise and practical farmers." Demonstration tests were arranged with a number of these farmers to show the value of the improved seeds developed by the college. Other activities included the distribution and sale of silkworm eggs, the treatment of wheat and other cereals for smut control and of a large number of cattle for rinderpest, and the offering of a correspondence course in forestry. One extension agency which has been found of great value is the *Agricultural and Forestry Newspaper*, with a paid subscription list of 2,000, and which through reprinting in other periodicals is estimated to reach 50,000 people an issue.

The experiment station of the college was organized in 1918 and is administered by two co-directors, who likewise serve as co-deans of the college. An estimate of the distribution of the time of the college staff among administration, teaching, and research shows a total of

8 full time workers on research, 4 with three-quarters time, 10 with half time, and 4 with one-quarter time.

Soon after the establishment of the station, provision was made for the organization of its work on a project basis under the supervision of a committee on research and investigation. Every proposed investigation must be submitted to this committee before it may be undertaken, with information as to the reasons for its prosecution, uses to be made of the results, location, cooperation, probable date of completion, and estimated cost. If the project is approved, a working plan must be submitted in detail giving a review of the present knowledge and indicating wherein this is insufficient; outlining the methods to be used in the investigation, including the equipment to be used; and giving a careful estimate of the cost. Progress reports and data must be submitted to the committee at regular specified times.

The experimental work undertaken has covered a considerable range, but special attention has been given to sericulture, cereal and cotton improvement and smut control, and forestry. The sericultural studies have been especially comprehensive, including mulberry tree production, silkworm culture, and the combating of diseases. Much progress has been secured in various directions, notably in the production of 902,960 disease-free layings of eggs in 1926, the percentage of diseases having been reduced from 70 per cent of all eggs in 1919 to 11 per cent in 1926. The forestry studies have centered largely around erosion and its control. Of late increasing attention has been given to economic problems, including farm management surveys, studies of farm credit and cooperative institutions, farm bookkeeping, and farm tenancy.

The publications of the college appear in Chinese or English, or, in some cases, in both languages. The more technical results are issued as bulletins or as contributions to a wide range of periodicals, both in China and abroad.

Closely allied to the investigational work is the research library, assembled in cooperation with the Library of the United States Department of Agriculture and numbering nearly 40,000 volumes. A special feature of this library is the attention which has been given since its organization in 1923 to the indexing of the voluminous Chinese literature, which has hitherto been available only with great difficulty. A work on famines, Records of Methods of Relief, and three other important treatises, Essentials of Agriculture and Sericulture, Outlines of Sericulture, and Seasonal Agricultural Practices, the last named comprising 78 volumes, have been indexed completely. A comprehensive bibliography on Chinese agricultural literature, listing over 2,000 titles, has been published, and a member of the college staff has compiled an extensive list of Chinese terms employed

in agricultural science. The preparation of an agricultural encyclopedia based on the ancient Chinese writings is also under way, and when available is expected to be of much value to agricultural workers in foreign countries, as well as in China.

The report under discussion was prepared before the stirring military and political events occurring in 1927 had brought about many changes, but relatively recent information is available through a brief accompanying announcement issued July 15, 1927. To quote from this announcement, "we are glad to report that the College of Agriculture and Forestry is still carrying on. So far as we know, our plant improvement field work, both at Nanking and at the cooperating stations, has carried through without mishap, all plantings of winter crops having been harvested and data secured, and all summer crop plantings having been made. We had an excellent sericulture season with a production of over a million layings of silkworm eggs. We have as yet had no labor difficulties. Field trips in connection with our extension activities had to be curtailed somewhat on account of disturbed conditions in the countryside. Classroom work has suffered most, though practically all the classes taught by the foreign teachers under way at the beginning of the spring semester were cared for by substitute teachers, chiefly by the associates in the various departments.

"Our only plans for the future are to carry on. A number of experienced teachers, returned students, are being secured, and we hope the majority of our foreign staff on regular or emergency furlough will return in due time. Special emphasis will, for a time, be placed on extension activities and on the preparation of extension materials for Government, institutional, or mission use.

"The interest of the Government in the welfare of the rural people should present us with an excellent opportunity for wider service. Some of our field investigations and research will have to be temporarily curtailed—not abandoned—and our entire staff can be most effectively utilized on the more immediate problems to which changed political conditions have given rise. In the face of rapidly changing conditions and many bewildering problems the College of Agriculture and Forestry nevertheless is looking forward to greater things."

This message is comparatively reassuring. The note of courage and quiet determination to render the utmost service possible which it reveals is most inspiring. There will be widespread hope that more favorable conditions will obtain in the near future, and that the institution will be able to resume in tranquillity and with adequate resources its full program of service to China and to the world.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Transactions of the American Institute of Chemical Engineers (*Amer. Inst. Chem. Engin. Trans., 18 (1926), pp. IV+497, pls. 7, figs. 142*).—About one-third of this volume is taken up with a symposium on the corrosion of metals, the papers presented in this discussion being as follows: Corrosive Effect of Nitric Acid, Mixed Acid, and Sulphuric Acid on Some of the New Alloys, with Special Reference to Stainless Steels, by F. F. Chapman (pp. 7–18); Corrosive Effect of Nitric, Hydrochloric, and Sulphuric Acid on Pure Lead and Lead Containing Small Amounts of Copper and Antimony, by J. C. Olsen, M. H. Quell, and W. G. Holley (pp. 19–36); Chromium Alloys in Chemical Plant Apparatus, by C. E. Macquigg (pp. 37–46); Note on the Corrosive Action of Mist and Fume, by E. Anderson (pp. 47–49); Rolled Zinc and Zinc-Coated Products for Industrial Structures, by J. P. Hubbell and W. H. Finkeldey (pp. 51–67); Corrosion of Flues and Sheets in Locomotive Boilers, by W. M. Barr and R. W. Savidge (pp. 69–88); Working Corrosion-Resistant Metals, by W. S. Calcott (pp. 89–93); Corrosion in the Laundry Industry, by J. N. Vermilya (pp. 95–101); Stoneware Exhaust Fans and Blowers, by P. C. Kingsbury and F. E. Mehrhof (pp. 103–129); Can Corrosion Be Prevented? by M. Toch (pp. 131–138); The Effect of Boiling Orange Juice on Various Alloys and Metals, by A. L. Blount and H. S. Bailey (pp. 139–148); and What Do We Know About Copper-Nickel Alloys? by M. G. Corson (pp. 149–163). The remainder of the volume consists of papers on miscellaneous subjects of interest in chemical engineering practice.

Lime symposium (*Indus. and Engin. Chem., 19 (1927), No. 5, pp. 550–605, figs. 38*).—This consists of the following papers: The Problem of the Lime Industry, by J. R. Withrow (pp. 550–552); The Consumer, the Market, the Lime Business, and the Chemical Industry, by C. Warner (pp. 552–554); Present Progress and Future Tendencies in the Lime Industry, by O. Bowles (pp. 554–556); Bridging the Gap between Research and Profits in the Lime Industry, by W. E. Carson (pp. 556, 557); Some Variables Affecting the Behavior of Limes Used in Causticizing, by J. V. N. Dorr and A. W. Bull (pp. 558–561); The Problem of Rate of Soil Liming (see above), by J. A. Slipher (pp. 561–564); Lime in the Paper Industry, by P. A. Paulson (pp. 564–566); Use of Lime in Water Softening and Water Purification, by C. P. Hoover (pp. 567–570); The Use of Lime in Butter-Making, by O. R. Overman (pp. 571–573); Lime Problems in the Beet Sugar Industry, by R. W. Shafer (pp. 573–576); The Rôle of Lime in Tanning, by G. D. McLaughlin (p. 576); Lime in the Treatment of Pea Cannery Wastes, by L. F. Warrick (pp. 577–583); An X-Ray Study of Limes Having Different Plasticities, by M. Farnsworth (pp. 583–588); Effect of Particle Size on the Hydration of Lime, by F. W. Adams (pp. 589–591); High-Temperature Whitewash, by E. P. Arthur, W. B. Mitchener, and J. R. Withrow (p. 591); Burnt Lime and Raw Limestone in the Basic Open-Hearth Process, by C. H. Herty, jr. (pp. 592–594); Effect of Steam on the Decomposition of Limestone, by E. E. Berger (pp. 594–596); Rotary Kilns vs. Shaft Kilns for Lime-Burning, by R. K. Meade (pp. 597–600); Science and Engineering in Lime-Burning, by V. J. Azbe (pp. 600–604); and The Needs and Future of Lime in the Chemical Industry, by J. R. Withrow (pp. 604, 605).

The first four and the last deal more or less generally with the need for more scientific methods, including the study of the specific needs of various chemical industries utilizing the various types of limes. The remaining papers deal with specific uses of lime and with special questions of its chemistry and manufacture, as indicated by the titles.

On sodium as a constituent of plants [trans. title], G. BERTRAND and J. PERIETZEANU (*Bul. Soc. Chim. France, 4. ser., 41 (1927), No. 5, pp. 709–713*).—Though potassium is a known essential component, the presence in plants of significant proportions of sodium has not been established, principally because of the errors of the various methods used. The literature of these methods in their application to the analysis of vegetable material is briefly reviewed. The method of precipitating sodium uranium magnesium acetate was finally selected for use in the experiments here described, as giving the best results of all the methods tested. The ashes of the leaves, fruit, or entire aerial part of nearly 30 species were examined for sodium as determined by precipitation in the form of the above-mentioned triple acetate, the plant material being in all cases carefully washed free from dust, etc. In all cases appreciable quantities of sodium were found, the range being from 0.0013 to 3.51 per cent in the dry matter and from 0.016 to 16.78 per cent in the ash. It is concluded that sodium is probably a normal constituent of all plants.

The seat of formation of amino acids in Pyrus malus L., W. THOMAS (*Science, 66 (1927), No. 1700, pp. 115, 116*).—This note consists principally of a brief review and discussion. The author's four years of experimental investigation on the nitrogen metabolism of *P. malus* are very briefly summarized, showing that both qualitative and quantitative tests demonstrate nitrates in the fine roots throughout the season, with much feebler reactions in the main roots and entirely negative tests in the aerial parts except in the opening buds. Quantitative tests for amino acids were higher in the roots than in the aerial parts. The conclusion is reached that, at least in *P. malus*, the reduction of nitrates to amino acids occurs mostly in the roots, and that, although experiments in vitro may suggest types of reactions possibly occurring in the cells of plants or animals, the extension of the results of such experiments as indicating the actual conditions or processes in vivo should be made with caution.

The gossypol content and chemical composition of cottonseeds during certain periods of development, W. D. GALLUP (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, pp. 987–992*).—The greatest change in the chemical composition of the cotton seed occurred at the maturity of the boll, the gossypol content increasing rapidly until the boll opened, with some increase for some time after the opening. The gossypol increased more rapidly than any other constituent, the oil and other constituents increasing but slowly. There was no correlation to be found between the formation of the oil and the formation of gossypol. The results are summarized in the following table:

Chemical composition and gossypol content of 500 cotton seeds at different stages of development

Condition of boll or seeds	Weight of dry seeds	Ash	Crude protein	Crude fiber	Nitrogen-free extract	Ether extract	Gossypol
	Grams	*Grams*	*Grams*	*Grams*	*Grams*	*Grams*	*Grams*
About to open	20.09	1.25	5.72	3.73	6.59	2.81	0.010
Just open	36.46	1.51	11.96	5.56	10.20	9.23	.165
Open 2 to 3 days	43.27	1.37	12.32	6.55	12.30	10.74	.200
Open 5 to 8 days	44.77	1.41	13.36	6.86	12.51	10.62	.241
Open over 8 days	40.62	1.35	11.58	6.18	11.65	9.92	.222
Mature seeds picked Feb. 1	40.32	1.31	12.25	5.80	10.58	10.38	.222
Seeds obtained from gin	40.96	1.36	11.58	6.46	11.66	9.66	.168

Studies with phytosterols, I–III, F. P. NABENHAUER, R. J. ANDERSON, R. L. SHRINER, and G. O. BURR (*New York State Sta. Tech. Bul. 124 (1926), pp. 3–41*).—These papers have been noted from another source (E. S. R., 56, p. 310).

Studies with phytosterols, IV–VI (*New York State Sta. Tech. Bul. 124 (1926), pp. 42–67; Jour. Biol. Chem., 71 (1927), No. 2, pp. 389–418*).—These papers complete the series noted above.

IV, *The distribution of dihydrositosterol in plant fats,* R. J. Anderson, F. P. Nabenhauer, and R. L. Shriner (pp. 42–51).—This reports the isolation of appreciable quantities of dihydrositosterol from the fatty constituents of corn gluten, corn bran, wheat bran, rice bran, and from corn oil and wheat germ oil. The melting points of the dihydrositosterol preparations from these different sources show a variation of from 141 to 146° C., and the specific rotations vary from +23 to +25°. The acetyl derivatives melt at from 137 to 141° and vary in specific rotation from +13 to +14°. It is stated that the cause of these variations can not be determined from the present data.

V, *The reduction products of certain plant sterols,* R. J. Anderson and R. L. Shriner (pp. 52–56).—This paper deals with the compounds obtained by reducing three isomeric sitosterol preparations by means of hydrogen catalyzed with platinum black. The α and β sitosterols yielded apparently identical α and β sitostanols, the melting points being about 140°, while the melting points of the acetyl derivatives were about 137 to 138°, but that of the reduction product of the γ sitosterol is 144 to 145°, and that of its acetyl derivatives is about 143 to 144°. The specific rotation of the γ reduction product also differs from those of the α and β products, as does the specific rotation of the acetyl derivatives.

VI, *Properties of cholesterol obtained from different sources,* R. J. Anderson (pp. 57–67).—The recrystallization of apparently pure cholesteryl acetate from ethyl alcohol yielded a bottom fraction having a much lower melting point and a lower optical rotation than the top fraction. It is suggested that if cholesterols are formed from plant sterols a number of different cholesterols corresponding to the various phytosterols of the plant material serving as food might be expected in animal fats.

Casein and its industrial applications, E. SUTERMEISTER (*New York: Chemical Catalog Co., 1927, pp. 296, figs. 37*).—This monograph of the American Chemical Society series consists of chapters by specialists in various phases of casein chemistry and technology, as follows: The Organic Chemistry of Casein, by R. A. Gortner (pp. 13–39); Physical Chemistry of Casein, by J. A. Wilson (pp. 40–59); The Manufacture of Casein, by A. O. Dahlberg (pp. 60–102); Casein in Paints, by A. H. Warth (pp. 103–123); Casein in Paper Making, by E. Sutermeister (pp. 124–141); Casein Plastics, by G. H. Brother (pp. 142–168); Casein Glue, by F. L. Browne (pp. 169–219); Casein in Medicine, by P. Masucci (pp. 220–235); Casein in Foods, by H. A. Schuette (pp. 236–249); Miscellaneous Uses of Casein, Statistics, and Bibliography (pp. 250–260); Storage of Casein, by A. H. Warth (pp. 261–271); and Testing and Analysis of Caseins, by E. Sutermeister (pp. 272–282).

Nitrogen in industry, J. C. MCLENNAN ET AL. (*Canada Natl. Research Council Bul. 12 (1926), pp. 55, fig. 1*).—This bulletin is presented in three parts. Part 1 deals with the sources of world production of nitrogen compounds, describing the various processes of nitrogen fixation, namely, the electric arc, cyanamide, ammonia, and cyanide processes. It also deals with nitrogen compounds from by-products and with Chilean saltpeter, as well as with such uses of nitrogen compounds as the manufacture of explosives and dyes, the application of ammonia in refrigeration, various miscellaneous uses, and the preparation of nitrogenous fertilizers. Part 2 is a brief general study of

phatic, and nitrogenous fertilizers. Part 3 is a monographic study of urea, dealing with the history, properties, manufacture, and uses of this substance and concluding with some notes on the possible future of the urea industry.

Freezing as a method of preserving plant tissue for the determination of nitrogenous fractions, G. T. NIGHTINGALE, W. R. ROBBINS, and L. B. SCHERMERHORN (*New Jersey Stas. Bul. 448 (1927), pp. 16*).—Nitrogen fractions designated as protein nitrogen, soluble nitrogen, proteose nitrogen, and basic, amide, amino, ammonia, humin, and nitrate nitrogen were determined before and after freezing tests of 48 hours and of 7 days, the tissues studied including beet leaves, tomato stems, sweet potato stems (48 hours only), and sweet potato storage roots.

Freezing was not found to alter the distribution of nitrogen among the fractions mentioned when these were determined according to the methods given. The freezing was done in an ice-salt bath the temperature of which varied between −5 and −14° C. When sweet potato storage roots were frozen for 36 hours and then held for 12 hours at +2°, however, a decrease in the protein nitrogen fraction and an increase in the nitrate-free soluble nitrogen fraction were noted.

A method for the saponification of butter fat for determining the Reichert-Meissl number, G. SPITZER and W. F. EPPLE (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 193, 194*).—The authors describe a method for saponifying butterfat with concentrated potassium hydrate for determining the Reichert-Meissl number. This method has the advantages of adding speed to the weighing and saponifying of fat, introducing no foreign substances such as alcohol or glycerin, and reducing carbon dioxide contamination to a minimum.

On the colorimetric determination of milk sugar by means of caustic potash [trans. title], A. STAFFE (*Fortschr. Landw., 2 (1927), No. 15, pp. 496–499*).—The coloration of milk on the addition of caustic potash and heating is dependent upon a number of factors other than the lactose content, so that no colorimetric method can be based upon the red-brown colorations ordinarily secured in this reaction if results at all accurate are to be obtained. In experiments upon a protein- and fat-free serum, however, in which this was briefly warmed on a water bath with an equal volume of 5 per cent caustic potash and examined in a Klett microcolorimeter, milk sugar values were obtained which agreed well with those obtained by iodometric methods.

The procedure was essentially the following: Heat 3 cc. of the fat- and protein-free serum with an equal volume of 5 per cent caustic potash solution for 1 minute in the water bath at 90° C. After cooling to 15° compare in a Klett microcolorimeter with a similarly treated standard serum of known milk sugar content. The calculation of the results is founded upon Beer's law.

The determination of sulfurous acid in sugar solutions [trans. title], MESTRE (*Bul. Assoc. Chim. Sucr. et Distill., 44 (1927), No. 9–10, pp. 317–319*).—In attempts to make a direct iodometric determination of the sulfurous acid in sugar solutions, high and irregular results were frequently obtained. Distillation was considered impracticable on account of the small amounts of sulfurous acid to be determined. The trouble was traced to iodine-reducing sugars. These were found not to react at all rapidly at pH values below 7, and an accurate direct iodometric determination was found to be possible when the pH value of the solution was held at or below 7.

A new method for determining copper in mold-proofed fabrics [trans. title], BONNARD and LEBLANC (*Ann. Chim. Analyt., 2. ser., 9 (1927), No. 8, pp. 233–236*).—The following procedure is proposed as more rapid, more convenient, and more accurate than that dependent upon the fusion of the sample with potassium carbonate and potassium nitrate mixture:

Cut out 1 square decimeter of the cloth to be examined. Cut it up into fragments about 1 sq. cm. in area and ash in a platinum dish of about 7 cm. diameter and 2 cm. height. The ashing should be conducted in a highly oxidizing atmosphere and should be carried to the point of complete disappearance of all carbonaceous particles. Add about 5 gm. of pure fused potassium bisulfate, together with an equal quantity of pure fused sodium bisulfate. Gradually raise the temperature to a dull red heat and hold at about this temperature for 2 minutes, obtaining a clear liquid. Permit this to cool, take up in 200 cc. of hot distilled water, wash out the dish, and add the washings to the main solution. Add a few drops of hydrochloric acid. Pass a rapid current of hydrogen sulfide through the solution for about 5 minutes at a temperature of 50° C., precipitating the copper entirely as sulfide. Let stand for 15 minutes, filter, and wash. Place the filter and its contents in the vessel in which the precipitation was made, redissolve the precipitate with 20 cc. of water and 10 cc. of nitric acid, and boil gently for 10 minutes. For an accurate determination of the copper electrolyze this solution after filtration, for a rapid determination titrate with potassium cyanide solution.

METEOROLOGY

World weather records (*Smithsn. Misc. Collect., 79 (1927), pp. VII+1199*).—This is a collection of data, prepared from official sources by F. Exner, G. C. Simpson, G. Walker, H. H. Clayton, and R. C. Mossman, in response to a request of the International Meteorological Conference at Utrecht in 1923. The data, which are arranged alphabetically by grand divisions of the earth, include monthly and annual means of pressure, temperature, and rainfall. An appendix is added, giving the relative sunspot numbers of Wolf and Wolfer as revised by A. Wolfer of Zurich, and their annual variation is briefly discussed.

Is it possible to predict California's rainfall several months in advance? E. A. Beals (*Bul. Amer. Met. Soc., 8 (1927), No. 6–7, pp. 103–107*).—The author concludes from his study on the subject that "the most hopeful solution of the problem of long range forecasting in California lies in getting more detailed information about the winter high pressure center of action over Asia." He states that the most powerful high pressure center is that central over Mongolia, and this controls largely the track of the storms responsible for California rainfall.

Our climate, R. Nunn (*Baltimore: Md. State Weather Serv., 1926, 3. ed., enl., pp. 51, figs. 30*).—This is a third edition of this publication, which has previously been noted (E. S. R., 52, p. 316).

The effect of climate upon the production of corn, P. C. Menor (*Thesis, Col. Agr., Univ. Philippines, Los Banos, 1926; abs. in Philippine Agr., 16 (1927), No. 2, pp. 109, 110*).—Reference is made to studies of the effect of rainfall, temperature, wind velocity, evaporation, and insolation, with 13 consecutive plantings at 28-day intervals of Calauan Yellow Flint, a native variety, and Mexican June, a foreign variety. The results obtained are summarized as follows:

"(1) The season most favorable for corn production is when the rainfall is about 312.6 mm. [12.3 in.] (2) Temperature, insolation, and wind velocity had no relation to the production of corn. (3) The best months for planting Calauan Yellow Flint corn were found to be March, December, and January. (4) The best months for planting Mexican June corn were found to be March, September, and June. (5) The month which proved unfavorable to corn production was August, when the rainfall reached about 752.7 to 948.4 mm. (6) Evaporation influences corn production. Highest yield was obtained when the evaporation was high."

SOILS—FERTILIZERS

Grouping of soils on the basis of mechanical analysis, R. O. E. Davis and H. H. Bennett (*U. S. Dept. Agr., Dept. Circ. 419* (*1927*), *pp. 15, figs. 2*).—This circular reports a study of soil classification on the basis of mechanical analysis, with a brief review of the literature and a comparative study of previous schemes. It is concluded that, inasmuch as the proportions of sand, silt, and clay in a soil sample can not be shown on a right-angled diagram, an equilateral triangle should be used, on which each of the components of a ternary mixture may be represented. The diagram reproduced herewith is that proposed in the bulletin. The limits for the classes of sand, silt, and clay, which have been defined in accordance with the judgment of field men, are indicated in this diagram and in a revised classification, for which the original must be consulted.

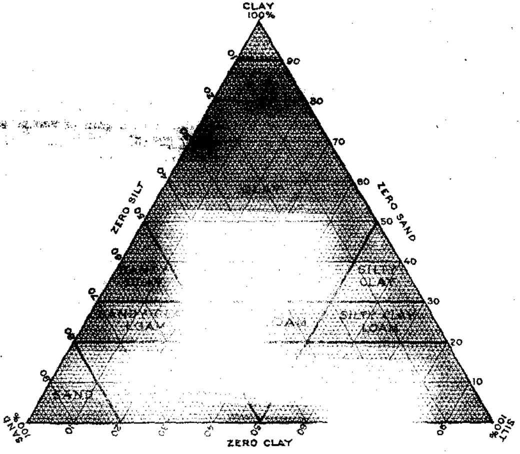


Fig. 1.—Diagram showing 10 of the main soil classes in relation to their percentage composition of sand, silt, and clay

Zeolite formation and base-exchange reactions in soils, P. S. Burgess and W. T. McGeorge (*Arizona Sta. Tech. Bul. 15* (*1927*), *pp. 359–399, figs. 7*).—The series of experiments reported in this bulletin, continuing previous work (E. S. R., 57, p. 210), include titrations of sodium silicate, sodium aluminate, and of combinations of the two against acids and acid salts, with a study of the resulting precipitates; a series of capillary experiments in which acid and alkaline soils were treated with alkaline and with acid solutions of silicon and aluminum compounds; and experiments on the preparation of artificial zeolites by the interaction of sodium aluminate and sodium silicate, with a subsequent replacement of the sodium in the precipitate by calcium in a base exchange with calcium chloride.

It is concluded from these experiments that the formation of zeolites in soils may be due largely to the interaction of soluble aluminates and silicates, that zeolites are to be regarded as definite chemical compounds capable of ionization and true chemical reaction, and that base exchange in soils is to be considered rather as double decomposition than as consisting of physical adsorption phenomena.

In addition to the above noted experiments a study was made of the base exchange capacity of the soil organic matter from which the conclusion is drawn that soil organic matter does not possess a true base replacement capacity but rather a capacity for the physical adsorption of solutes.

[Soil fertility studies at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 143 (1927), pp. 1–5, 7, 8*).—The following studies are briefly reported:

General soil fertility test.—In experiments on the relative value of various fertilizer treatments in this section of Indiana begun in 1917, the average yield per acre of corn, soy beans, wheat, and clover hay, together with the estimated value of the crops in the rotation, the increases due to the various fertilizer treatments used, the cost of these fertilizers, and the net gain from each type of treatment are tabulated. It is concluded that phosphorus is by far the most important fertilizer need of this soil. The greatest average net gain shown is that of $32.91 per acre from the combined use of phosphate, potash, and nitrogen. Lime and phosphate almost equalled this with a gain of $30.20, and lime, phosphate, and potash showed an increase of $28.85.

Comparison of phosphates.—The largest returns reported have been obtained from a combination of lime and manure with heavy applications of acid phosphate, the average increases being 27.9 bu. of corn, 8.6 bu. of wheat, and 1,680 lbs. of mixed hay per acre since 1916, valued at a total of $134.26 per acre, at a total cost of $30.92 for the lime and phosphate. Acid phosphate has been the most profitable form of phosphorus for limed and manured land, the order of decreasing efficiency being acid phosphate, basic slag, steamed bone meal, and rock phosphate. Where lime was not used rock phosphate has proved more profitable than acid phosphate, except on manured land. These experiments were carried out on a field laid out and tile drained in 1915, the crop rotation being corn, wheat, and clover, with all produce removed except second-growth clover.

A practical plant food program.—It is considered that the greatest single need of this soil type is phosphorus, and that this element should be applied liberally. Two tons at least of ground limestone per acre are recommended, together with the inclusion of clover in the crop rotations and preferably soy beans also between the corn and wheat; and in addition at least 400 lbs. of acid phosphate per acre should be applied during each round of the rotation.

Soil fertility investigations (*Michigan Sta. Rpt. 1926, pp. 13, 14*).—A mixture of phosphatic and potassic fertilizers has proved the most profitable treatment for the leguminous crops, both alfalfa and sweet clover. Acid phosphate and potash on Emmet sandy loam in northern Michigan increased the yield of alfalfa seed. Nitrate of soda was not found profitable for application to alfalfa and sweet clover. Oats on rich soils and corn on manured lands responded most profitably to acid phosphate. Though potatoes responded to a wide range of fertilizer mixtures, acid phosphate appeared the most important component, and a 3–12–4 mixture gave the most consistent results.

Experiments with lime are briefly reported, from which it is concluded that the larger and more economical yields are procured over a period of years from the coarser grades of lime, that the beneficial effects are more prolonged than were anticipated, and that freshly recovered marls are unsuitable as liming

material on new alfalfa seedings, the injury appearing to be due to the presence of sulfides.

[Soil studies by the Tennessee Station, 1926] (*Tennessee Sta. Rpt. 1926, pp. 23, 24, 41–43*).—Studies briefly reported include the following:

Cumberland Plateau [*experiments*], L. R. Neel.—The great importance of phosphate and lime continues to be evident. The land, which was newly cleared at the outset of the experiments, produces but poor crops when the phosphate and lime are omitted.

Sulfur conservation in soils as influenced by calcium and magnesium, W. H. MacIntire.—Sulfates were found not to furnish an increased supply of potash to growing plants when a favorable alkaline reaction had been produced by liming.

Miscellaneous work, W. H. MacIntire.—A study of the effect of liming upon the availability of soil potash and upon both the availability and the fate of added potash, in which six solvents, including water and carbonated water, were used, is very briefly reported. It is concluded that the solubility of both native and applied potash is repressed by additions of lime. Evidence confirmatory of this conclusion was obtained by the determination of the potash leached from lysimeters. It was definitely established that liming prevented the loss of a large amount of added potash.

Experiments with manure in Hamilton County, J. S. Cutler and W. E. Weaver (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 117–120*).—Results from the four following treatments are reported, the rotation being corn, soy beans, wheat, and clover: (1) Manure alone, 5 tons on the corn and 5 tons on the wheat; (2) manure as above and acid phosphate 200 lbs. on the corn and 200 lbs. on the wheat; (3) same as 2 with the addition of 1 ton per acre of limestone, and (4) manure 5 tons on the corn, acid phosphate 200 lbs. applied to the corn, limestone 1 ton, and 320 lbs. of 3–10–8 fertilizer applied to the wheat. The tabulated increases in yields and the calculated values of these increases show the third of the above treatments to give decidedly greater increases of yield from corn (14-year average) and distinctly greater increases of yield of soy beans (12-year average), wheat (13-year average), and clover (12-year average) than did the first or second treatments. The fourth treatment shows figures nearly as good as those of the third treatment with respect to corn and wheat, but somewhat less good for soy beans and much less for clover.

The degree of response of different crops to various phosphorus carriers, B. L. Hartwell and S. C. Damon (*Rhode Island Sta. Bul. 209 (1927), pp. 19*).—Continuing previous work (E. S. R., 33, p. 722), this bulletin reports the last third of a field comparison of phosphatic fertilizers begun in 1894, the comparison being made in general on the basis of insufficient total phosphorus with liberal supplies of nitrogen and potash. During the period reported in this bulletin (1914–1925), the nitrogen in the bone phosphate has been matched by organic nitrogen added with the nonnitrogenous phosphate carriers, with the result that bone was not found superior to acid phosphate. After liming to neutrality, manganese-deficiency chlorosis affected some of the crops except where Thomas slag, which is manganiferous, was used. Extra acid phosphate also tended to inhibit the chlorosis. Triple superphosphate has continued somewhat inferior to other forms. Raw rock phosphate applied on an equal cost basis as compared with acid phosphate plowed in with aftermath once in four years was fully as useful as triple superphosphate, but not equal to other sources. Cabbages, rape, and rutabagas were especially able to get their phosphorus from floats. Evidence was obtained which suggests that even the comparative availability of phosphatic fertilizers may vary with the kind of crop used.

The problem of rate of soil liming, J. A. Slipher (*Indus. and Engin. Chem., 19 (1927), No. 5, pp. 561–564, figs. 9*).—Seventeen liming experiments on 12 or more soil series are summarized, the analysis of the results of these trials indicating that in the evaluation of a lime treatment in terms of the efficiency per unit of lime the magnitude of both the change in soil reaction and the crop response favors the lighter rates of lime application. Though the sensitivity of the crop and the intrinsic soil requirement modify the amount of the necessary application, it appears in general advisable to use lower rates of liming than have been commonly recommended in the past. One of a number of examples given is that of a soil of the Volusia series, Bradford County, Pa., where in spite of a high indicated lime requirement (4,100 lbs. of lime oxide per acre) good results were obtained from a lime application of but 150 lbs. of oxide per acre per year which resulted in a little over 5,240 lbs. of dry matter in the crop per 1,000 lbs. of lime, whereas the indicated rate of 850 lbs. per year to bring the soil to the neutral point gave a yield of but 1,440 lbs. of dry matter in the crop per 1,000 lbs. of lime.

AGRICULTURAL BOTANY

The water requirement of plants at Akron, Colo., H. L. Shantz and L. N. Piemeisel (*Jour. Agr. Research [U. S.], 34 (1927), No. 12, pp. 1093–1190, figs. 16*).—The materials for this detailed account, which presents results of water-requirement measurements at Akron, Colo., during 1911–1917, and published in part previously, have been collected and arranged by the present authors. A considerable portion of the work by Briggs and Shantz here represented has been noted (E. S. R., 33, p. 726; 36, p. 225).

The measurements dealt with a total of 288 sets of plants and more than 1,800 pots. It was possible on the basis of the average year to compare the widely different crops used in this work. The lowest values, based on total dry matter, were obtained for the millets, sorghums, and corns; the highest values for the native plants, flaxes, and legumes. The water-requirement range was very great, from 216 units of water for one unit of dry weight for Kursk millet to 1,131 for Franseria, a native weed. The most efficient plant was the introduced millet Kursk S. P. I. 30029, followed in order by Black Veronezh proso C. I. 15, tumbleweed, Tambov proso, Kursk millet S. P. I. 22420, Minnesota Amber sorghum, Kursk millet S. P. I. 34771, German millet, purslane, brown kaoliang, Black Veronezh S. D. 331 millet, Dakota Amber sorghum, Red Amber sorghum, Blackhull kafir, buffalo grass, and Esperanza corn, all of which have a water requirement under 300. Ranges are indicated.

The range in water requirement during different years at Akron is also very great, the lowest values averaging about 60 per cent of the highest. The greatest range is for oats, for which the lowest value is 48 per cent of the highest, while the lowest range is for sorghum, for which the lowest value is 80 per cent.

Variation of the transpiring power of leaves as related to the wilting plants, R. Kōketsu (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1926), No. pp. 241–260*).—Studies on the variations in the transpiring capability of plants in relation to their wilting as carried out with *Coleus blumei*, *Triticum vulgare* and *Glycine soja* are detailed in their several phases. The ratio of the index of the foliar transpiring power at a definite time of the day, at which the highest value of daytime indices is most often found, to the index at night, when transpiring power is generally low, called the "day-night ratio," was used for judging the degree of the daily fluctuation of the transpiring power. The day-night ratio, as wilting progresses, approaches unity; i. e., an equilibrium phase is attained in which the foliar transpiring power shows for a time little variation. The value of this ratio tends to fall below unity after a

During the process of wilting the index of transpiring power decreases to its minimal value at the critical point of wilting, corresponding to the time of permanent wilting. It then begins to rise and the plant falls into the drying phase of low transpiration or evaporation. The same phenomenon occurs in uprooted plants. The value of the critical index seemingly tends to be practically constant for a given species whether rooted or uprooted plants be taken. Probably, however, it may be affected by such external factors as soil character. The critical indices, though approximately alike in the plants here studied, appear to be characteristic as to species individually. The soil moisture residue at the time the critical state of wilting is attained seems not to be constant for a given soil, but to be affected more or less by the nature of the plants.

"The index of the foliar transpiring power of a plant and the soil moisture residue at the time of the critical state of wilting may be applied as the measure of the comparative xerophytism of plants, in both the lower value showing the greater drought resistance."

The loss of water by plants in process of wilting [trans. title], A. A. NICHIPOROVICH (*Zhur. Opytn. Agron. Iugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *3* (*1926*), *No. 1*, *pp. 76–92*, *figs. 5*; *Eng. abs.*, *p. 92*).—It is found that plants of diverse types show different tendencies as regards water loss. During a first period, generally speaking, a decrease in transpiration rate occurs in all cases. This decrease in xerophytes and in plants having succulent leaves is very steep. The slight decrease in mesophytes changes into a temporary increase. After this a second decrease sets in and this continues until the death of the plant. Many xerophytes dry up more slowly than do mesophytes. The presence of water tissue in plants is of significance in connection with their desiccation. Plants having much water in stems or leaves live much longer than those having little.

Absorption of water by barley seeds, H. S. WOLFE (*Bot. Gaz.*, *82* (*1926*), *No. 1*, *pp. 89–103*, *fig. 1*).—Barley grains which have been soaked in a saturated solution of lithium chloride from 30 seconds to 12 hours show a weight-increase curve which practically reaches its maximum of 7.5 per cent during 2 hours. Apparently these grains absorb or adsorb some salt as oven drying fails to restore the original oven-dry weight, but this is approximately restored after soaking and redrying. The increase in weight of barley grains soaked in lithium chloride is due to the absorption of water and salt by the numerous layers of the grain external to the semipermeable layer, and not to the penetration of salt or water into the interior of the grain.

Attention is called to the alleged common error of assuming that the increase in weight of seeds placed in salt solutions, especially saturated solutions of great viscosity, is due entirely to water intake. "Actually it may be that as much as half of this gain in weight is due to absorbed salt."

A biological method for the study of light conditions in water [trans. title], F. RUTTNER (*Naturwissenschaften*, *12* (*1924*), *No. 50*, *pp. 1166*, *1167*, *fig. 1*).—A method is presented, with discussion of its modifiability to suit situations, for the study of conditions in water affecting plant development.

The influence of selective and general irradiation by a quartz mercury arc lamp upon the germination and growth of seeds, C. SHEARD and G. M. HIGGINS (*Science*, *65* (*1927*), *No. 1681*, *pp. 282–284*).—In the experiments reported, seeds of lettuce, radish, and turnip were subjected, under similar and as nearly as possible uniform conditions of moisture and temperature, to irradiation by a mercury lamp for daily periods of 1, 2, 5, and 10 minutes, after

which half of the seeds were kept in darkness while the others were placed under diffuse daylight.

It was found that in seeds which normally germinate and grow in darkness and underground the most rapid germination and maximal growth were attained by the normal nonirradiated seeds and roots kept constantly in darkness. The amount of growth of the seedlings kept in darkness decreased with the amount of irradiation. The least rapid germination and minimal growth were attained by normal, nonirradiated seedlings kept under maximal periods of diffuse daylight as transmitted by ordinary window glass. The action of diffuse daylight is said to inhibit germination of seeds and growth of roots. Irradiation by a quartz mercury lamp accelerated the germination of seedlings kept in subdued interior daylight as compared to the germination of normal nonirradiated seeds under similar conditions. In general, optimal conditions for continuous maximal growth of seedlings kept in interior daylight were attained under irradiation periods of from 2 to 3 minutes daily. The stimulus to most rapid germination of seeds kept under interior diffuse daylight was an initial irradiation of from 5 to 10 minutes. Longer periods seemed to have no additional stimulative effect.

The experiments are believed to lend support to the hypothesis that ultraviolet radiation in the so-called biologic or "near"-ultraviolet region aids in the germination and growth of a cell or normal functioning of an organism which is kept under an unphysiologic environment.

Study of growth and incurvation in whole and halved coleoptiles after geotropic stimulation [trans. title], U. WEBER (*Jahrb. Wiss. Bot., 66 (1926), No. 1, pp. 35–108, figs. 27*).—Growth and incurvation effects here noted are discussed in connection with critical comments on the findings of others.

Growth awakening in plant parts not morphologically equivalent by various stimulating agents [trans. title], H. JACOBI (*Österr. Bot. Ztschr., 75 (1926), No. 1–3, pp. 29–42, figs. 4*).—Low concentrations of certain salts, as solutions of the chlorides of potassium, calcium, sodium, and magnesium, may bring into growth resting vegetative organs of plants. Examples are given.

Starch grain development in potato tubers [trans. title], L. LINDET and P. NOTTIN (*Ann. Inst. Natl. Agron., 17 (1923), pp. 25–54, figs. 10*).—Potato tuber starch development has been followed in its various stages and phases, with results which are given in considerable detail.

Aleurone layer in seeds of Gramineae and other plant families [trans. title], F. KOLLE (*Nyt Mag. Naturvidensk., 64 (1926), pp. 116–128, pls. 4*).—All seeds which possess starchy endosperm show also an aleurone layer. General and specific observations are detailed.

Development of the female gametophyte and caryopsis of Poa pratensis and Poa compressa, A. M. ANDERSEN (*Jour. Agr. Research [U. S.], 34 (1927), No. 11, pp. 1001–1018, pls. 9, figs. 3*).—The evidence detailed is said to indicate that polyembryony in *P. pratensis* and *P. compressa* originates from two or more embryo sacs within the same nucellus. The further development is indicated.

[**Tomato pollination**], S. V. ANAN'EVA (ANANIEVA) (*Zhur. Opytn. Agron. Iugo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands), 3 (1926), No. 1, pp. 93–96, figs. 8; Eng. abs., p. 96*).—A case of cross-fertilization of tomato by wind and consequent hybridization is recorded.

The effects of leaching with cold water on the foliage of the apple, C. E. T. MANN and T. WALLACE (*Jour. Pomol. and Hort. Sci., 4 (1925), No. 3–4, pp. 146–161, figs. 2; abridged in Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1925, pp. 17–24, fig. 1*).—In the abnormally wet summer of 1924 foliage of several apple varieties showed an injurious form of spotting. This

was studied. The present account deals somewhat incompletely with that work and its results.

Immersion of a healthy leaf in water exposes it to at least two unfavorable processes, injection of intercellular spaces with water, with consequent asphyxiation of the cells in the injected region, and lixiviation, or leaching out, of soluble contents. The course and the extent of the removal of potassium compounds as indicated graphically, though ranging widely for the varieties investigated, show some correspondence to the spotting effects in the field.

Geographical distribution and the cold-resisting character of certain herbaceous perennial and woody plant groups, O. E. White (*Brooklyn Bot. Gard. Rec., 15 (1926), No. 1, pp. 1–10*).—Presenting in the present paper the question whether it is not probable that many tropical, subtropical, and temperate species give rise, through mutation, to individuals or to small groups of individuals much more cold-resisting than the individuals of the species as a whole, and that these "hardy" mutants remain for the most part unrecognized because they occur and grow under conditions where the character in question could not be expressed, the author cites examples with interpretations.

"Certain groups of plants were already so genetically constituted, when the climatic changes toward cooler temperatures took place, that most of them could live under these changed conditions as well as under the previous state. Possibly the Salicaceae, Equisetaceae, and Ephedraceae belong to these groups

"Other groups were completely destroyed in these regions and restricted to the Tropics. To such a class the Palmaceae and the Artocarpaceae possibly belong.

"Through mutations occurring in regions favorable both for increasing their own numbers and for aiding in their north and south distribution, the plants of the second group have been slowly emigrating into colder regions—in a sense coming back to the geographical regions in which their groups once thrived. But obviously comparatively few of the members of this group have or have had such favorable conditions for aiding in the establishment and distribution of their mutant types."

Osmotic pressure of cell sap and its possible relation to winter killing and leaf fall, F. W. Gail (*Bot. Gaz., 81 (1926), No. 4, pp. 434–445, figs. 3*).—The author states that in a study during nearly three years of evergreen plants in the Pacific Northwest the lowest osmotic cell sap pressure in the nondeciduous plants studied was found in the latter half of June and the early half of July. A gradual increase occurs from August to November, the stored starches changing to sugars, oils, etc., during the cooling period due to enzyms. Growth practically ceases by the middle of July. Drought may inhibit growth, but photosynthesis continues and the products are stored. Usually, a sudden increase of osmotic pressure occurs in December and January unless the temperature drops sufficiently (probably freezing the protoplasm). Failure of increase of osmotic pressure may occur (presumably due to failure on the part of enzyms to turn enough starch into sugar). This presumably explains the killing of *Pinus ponderosa* in December, 1924.

Reduced illumination lowers osmotic pressure in both deciduous and nondeciduous plant cell sap. Lowering temperature during fall and winter months corresponds consistently to increase in osmotic pressure in the cell sap of nondeciduous trees and shrubs. This is not true of the deciduous trees studied. In nondeciduous plants studied osmotic pressure increases as altitude increases.

Some effects of freezing on onions, R. C. Wright (*U. S. Dept. Agr., Dept. Circ. 415 (1927), pp. 6, pl. 1, figs. 2*).—The present study was confined to northern-grown onions of the globe type, the average freezing point of which

was found to range at and near 30° F., varying somewhat with the temperature at which the plants are grown and are held in storage. Onions may undercool without freezing, if not subjected to rough handling when cooled to temperatures below their normal freezing points. Freezing injury is readily confused with the results of physiological breakdown due to any of several causes. Onions having only the outermost scales injured by freezing may as a rule be salvaged if allowed to dry out.

Acidity of the medium and root production in Coleus, E. P. SMITH (*Nature* [*London*], *117* (*1926*), *No. 2940, pp. 339, 340*).—In order to test the effect which the reaction of the medium has upon root production by cuttings, experiments were made during the summers of 1924 and 1925 with Coleus. It is the practice at the Royal Botanic Garden, Edinburgh, to root in coconut fiber cuttings which require heat. It was found that rooting would take place only between pH 4.0 and 9.2. The condition of the carbohydrate reserves had a marked influence on the rooting.

The results of the studies here briefly indicated are considered to show that the free admission of air is one of the most favorable aspects of the fiber, and suggest that (for this plant at least), given equal supplies of oxygen, a reaction of the medium near neutrality would be preferable.

The families of flowering plants.—I, Dicotyledons, J. HUTCHINSON (*London: Macmillan & Co., 1926, pp. XIV+328,* [*pl. 1*], *figs.* [*293*]).—The families of Dicotyledons are here described in smaller and better defined groups, which are more easily fitted into the new phylogenetic scheme of classification presented in complete form for the first time. The key has been made entirely independently of that by Thonner, and emphasizes the resemblances amongst plants rather than their differences.

The physiology of Orobanche cumana [trans. title], A. A. RIKHTER (RICHTER) (*Zhur. Opytn. Agron. Iugo-Vostoka* (*Jour. Expt. Landw. Südost Eur.-Russlands*), *3* (*1926*), *No. 1, pp. 32–39, figs. 3; Ger. abs., p. 39*).—Th[illegible] transpiration rate of *O. cumana*, parasitic on *Helianthus annuus*, is (independ[illegible] ently of the lessening of the transpiring surface) very important, approachin[illegible] or equaling the transpiration rate of the host plant. The stomatal contr[illegible] apparatus of *O. cumana* is in a stage of retrogressive metamorphosis, presentin[illegible] a scant and functionless mechanism. The capitate hairs which besprinkle t[illegible] surface of the inflorescence function as hydathodes, which fully serve t[illegible] purpose of water separation.

Mycorrhiza of Taxus baccata [trans. title], H. PRAT (*Ann. Sci. Nat., Bo*[illegible] *10. ser., 8* (*1926*), *No. 1–2, pp. 141–163, figs. 15*).—A study of the mycorrhiza [illegible] *T. baccata* shows the association of the fungus with the host to be constant a[illegible] a true symbiosis. It is thought that the fungus may exercise considera[illegible] influence on the life of the host.

The physiology of the root fungi of Neottia nidus avis and some gre[illegible] Orchidaceae [trans. title], H. WOLFF (*Jahrb. Wiss. Bot., 66* (*1926*), *No.* [illegible] *pp. 1–34, figs. 12*).—Root fungi of *N. nidus avis*, after thorough sterilization w[illegible] alcohol, were produced in liquid nutritive media from roots of the orchid. [illegible] mycelium remained submersed in nearly all cases, both aerial hyphae and sp[illegible] chains being rare. Morphology and metabolism are briefly dealt with.

Life histories and heterothallism of the red bread-mold fungi of Monilia sitophila group, C. L. SHEAR and B. O. DODGE (*Jour. Agr. Rese*[illegible] [*U. S.*], *34* (*1927*), *No. 11, pp. 1019–1042, pls. 4*).—The red bread-mold fun[illegible] *M. sitophila*, said to have been first described in 1843 and to have caused tro[illegible] in bakeries in Europe and America, is reported as occurring widely on var[illegible] fruits, on tree trunks and stumps recently killed by burning, as recorde[illegible] [illegible] and Emoto (E. S. R., 54, p. 843), and on sugar cane bagasse.

The present study is claimed to have shown that at least four species have been passing under the name *M. sitophila*, the life history and taxonomic studies on which are recorded. "Instead of belonging to Sclerotinia, as might be expected from the great resemblance of the conidia to those of *M. cinerea*, the ascospore stage is found to be a pyrenomycete which seems to belong to an undescribed genus, which is named Neurospora."

Three of these are described as new species under the names *N. sitophila* (conidial stage *M. sitophila*), *N. crassa* (conidial stage *M. crassa*), and *N. tetrasperma* (conidial stage *M. tetrasperma*). The fourth is regarded as belonging to this newly erected genus, Neurospora, and is described as the new combination *N. erythraea* (conidial stage *M. erythraea*).

Bakeries contaminated with these fungi can be freed from them by thorough cleaning of walls, floors, and utensils with live steam, soap and water, formaldehyde, or any good antiseptic.

Studies of biochemical differences between (+) and (−) sexes in Mucors.—II, A preliminary report on the Manoilov reaction and other tests, S. SATINA and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 12 (1926), No. 3, pp. 191–196*).—The present investigation, taken in connection with previous studies by the authors of the tellurium reaction (E. S. R., 55, p. 520), is held to have demonstrated (1) that races of mucors differ from one another biochemically, even when of the same sex; (2) that the (+) and (−) races show significant average biochemical differences in respect to (*a*) the factors involved in the Manoilov reaction, (*b*) catalase content, (*c*) reduction of potassium permanganate by extracts, and (*d*) reduction of tellurium salts in living cells; (3) that sexual differences are suggested in regard to (*a*) peroxidase content and (*b*) total acidity of extracts; (4) that no sexual differences are evident in regard to pH in water or alcoholic extracts or to pH in the medium on which the fungi have grown and in regard to certain other macro- and microchemical tests; and (5) that in their biochemical reactions the (+) sex of mucors corresponds to the female and that the (−) sex corresponds to the male of higher animals and plants discussed in the succeeding paper.

Biochemical differences between sexes in green plants, S. SATINA and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 12 (1926), No. 3, pp. 197–202*).—Following up the paper above noted, the present one gives the preliminary results of a biochemical study of differences between the sexes in green plants. The technique employed is similar to that used with the mucors except that green leaf tissue was used in place of the fungus mycelium and, except for the alcoholic extracts, the material was ground with sand.

The Manoilov reaction has been tried in 172 cases included in 19 species and 14 genera. The reaction has proved to be a very delicate one, necessitating extreme care to use materials which are strictly comparable. The proper proportions of the different reagents must be determined for each species.

Sexual organs of flowers gave a reaction corresponding to the sex expression, though it is admitted that, since the male obviously contained less sap than the female organs, it is possible that the reactions obtained were due primarily to quantitative differences in extracts tested. The young ear of corn gave a male reaction in comparison with the young male flowers, but the former appeared to have a more dilute extract. It is admitted also that in all cases the leaves were examined during the fruiting period or at the time of flowering.

The data presented are believed to show more or less striking average differences in green plants between the sexes in respect to the Manoilov reaction, the color of leaf extracts, the presence of oxigenase, peroxigenase, and total acidity.

The mucor parasite Parasitella in relation to sex, S. SATINA and A. F. BLAKESLEE (*Natl. Acad. Sci. Proc., 12 (1926), No. 3, pp. 202–207*).—"From their biochemical behavior, therefore, with the possible additional evidence from gall reactions, which are doubtless biochemical in nature, we may provisionally assign the terms (+) and (−) to the sexual races of Parasitella."

A physiological study of the common bacteria of air, soil, and water with a view to their exact diagnosis, M. M. MEHTA (*Ann. Appl. Biol., 12 (1925), No. 3, pp. 330–358*).—A concise arrangement is attempted of methods used by the author for the study of bacteria common in air, soil, and water, with the experimental results. Details of technique are given to facilitate the work of repetition by others. The advantages claimed for this method over other methods are summarized, and a short bibliography is given.

GENETICS

Species-differences and gene-differences, G. BONNIER (*Hereditas, 9 (1927), pp. 137–144*).—Various hypotheses for the mutation of genes in the formation of new species are discussed.

Exceptional classes of individuals in an experiment involving the bar locus of Drosophila, T. H. MORGAN (*Hereditas, 9 (1927), pp. 1–9, figs. 6*).—Among 107,420 Drosophila bred in 41 generations at Columbia University by mating the eosin bar-eyed daughters with their vermilion-eyed brothers, both descendents from an origiual mating of an eosin bar female from a high nondisjunctional strain and she herself carrying two X chromosomes with a vermilion male, there occurred 37 individuals which did not conform to ordinary genetic expectations and 56 other cases due to a deficiency in the X chromosome. All but 3 of the 37 individuals were accounted for on the basis of known changes taking place at the bar locus. Seven mutants appeared, all of known types.

Inheritance of rate of shedding in a cotton hybrid, T. H. KEARNEY and R. H. PEEBLES (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, pp. 921–926*).—Observations on F_3 progenies of F_2 plants of the cotton hybrid, Pima Egyptian × Acala (E. S. R., 56, p. 128), which had shown respectively, high, intermediate, and low rates of shedding, afforded conclusive evidence that the shedding of flower buds and young bolls is partly determined by genetic factors. The positive correlation between rates of bud shedding and of boll shedding in both F_2 and F_3 further confirmed this conclusion. Apparently the inherited tendency to a high or a low rate of shedding expresses itself in abscission both before and after anthesis. The data did not suggest a satisfactory explanation of the tendency to greater sterility in F_2 than in F_3.

Inheritance studies with tobacco [trans. title], J. A. HONING (*Genetica [The Hague], 9 (1927), No. 1–2, pp. 1–18, figs. 10*).—A dwarf race of *Nicotiana tabacum* Deli differed from tobacco of normal height in a single hereditary dominant (not absolutely) factor. *F* is a practically dominant factor for the winged leaves of Hatano tobacco compared with *f* for the sessile leaves of Deli tobacco. *FF* is narrow, and *Ff* only slightly broader winged-petiolated; *n*, the deformis factor, is epistatic in regard to *FF*, *Ff*, and *ff*; and all *nn* plants are long-petiolated without wings. Crossing the deformis heterozygote with double-flowered Vorstenlanden tobacco resulted in a deficiency of deformis heterozygotes in F_2. *N. colossea ovanidotunicata*, after selfing and after crossing with *N. colossea* normal green, *N. colossea ovanidonucleata*, and *N. tabacum* Deli showed pure maternal inheritance in over 4,600 cases. The tendency of *N. colossea* not to bloom in the first year appeared to be dominant.

On the heredity of teratological characters: Double-flowered mutants in tobacco, W. H. Arisz (*Genetica [The Hague], 9 (1927), No. 1–2, pp. 39–100, figs. 9*).—The investigation described was concerned with the analysis of the factors influencing the characters of four double flowered (the corolla bearing a catacorolla) forms which were found in cultures of Kedoe (*N. tabacum*) and in F_7 of Kedoe×Bajesi.

The inheritance of ovate and related shapes of tomato fruits, E. W. Lindstrom (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, figs. 961–985, figs. 8*).—Quantitative determinations at the Iowa Experiment Station of fruit shape in the tomato, using as an index the ratio of the equatorial to the polar diameter, gave evidence that ovate fruit shape is determined genetically by a major recessive gene. Back-cross data particularly substantiated this hypothesis. The incompletely dominant allelomorphs of the ovate shape were the oblate or the round shape.

Linkage determinations proved that the ovate-determining gene is located in the first chromosome of the tomato and that the dwarf and ovate genes are closely linked, there being approximately from 10 to 11 per cent of crossing-over. The gene for peach shape also proved to be linked with the ovate shaped gene.

A high positive correlation was noted between shape and size of tomato fruits in a series of F_2 and back-cross generations involving the several shapes, suggesting that fruit shape factors of the first chromosome are likely linked with major fruit size factors. Crosses of oblate by round types gave evidence of the action of single major genes for these fruit shapes, although the differences were not so distinct as those differentiating ovate from round and oblate shapes. Environmental agencies seemed to affect oblate shape more than ovate shape. High correlations between shape and size were also observed in the F_2 of these crosses. Having demonstrated that oblate, round, and ovate shapes are determined by certain major genes located in the first chromosome, the hypothesis is offered that the three form a multiple allelomorphic system with the order of dominance oblate, round, and ovate. Many indications were found to suggest that fruit shape in general is determined by a simpler genetic mechanism than is the case with fruit size.

Mutational mosaic coat patterns of the guinea pig, S. Wright and O. N. Eaton (*Genetics, 11 (1926), No. 4, pp. 333–351, figs. 7*).—Seven cases of somatic mutations in coat pattern which have appeared in the more than 40,000 guinea pigs produced in breeding experiments in the U. S. D. A. Bureau of Animal Industry are described and discussed as to their possible explanations based on the factors transmitted to them and by them. In 2 cases in which the *F* factor and in 1 case in which the *P* factor were involved the individuals were probably heterozygous. The most plausible explanation of these cases was that the chromosome carrying *F* or *P*, respectively, was lost in one of the somatic divisions with mutation to the recessive as another possibility. Two black-sepia mosaics were apparently homozygous for *C*. One agouti-black mosaic was likewise homozygous for factor *A*. These 3 cases require for explanation the loss of two chromosomes or a double mutation or a mutation to an unknown dominant in the ontogeny of the somatic tissue to show the recessive character.

The seventh case was evidently both a somatic and a germinal mosaic in the albino series, showing the presence of both red agouti and yellow agouti, though both its parents were dilutes, the sire being c^dc^d or possibly c^kc^d, while the dam was c^dc^r. The genetic constitution of this mosaic was tested in matings with females of the constitution c^ac^a and with one c^dc^a. The sire produced 79

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intense and 149 dilute young, proving that he carried intense (C), but the ratio differed so far from the equality expected in a back cross heterozygous to recessive mating that it was concluded that his germ cells were about one-third C and two-thirds c^d, though there was some indication of variations in this proportion from time to time. The mosaic male is assumed to have been c^dc^d originally, but one c^d mutated to C in an ancestral cell, from which part of the germinal as well as somatic tissue was formed. The results presented suggest that the coat colors due to the effect of factors a, c^d, f, b, and p result from the presence of the genes in the nucleus of each cell and not by generalized action. The shape and distribution of the mosaic areas indicate that the cells descending from a single ancestral cell may be widely scattered and form irregular areas. Attention is called to the relationship between several of the mosaics as possibly indicating a hereditary tendency toward germinal instability.

Inheritance of white markings on the heads of black and white Swedish lowland cattle [trans. title], H. Funkquist (*Hereditas, 9 (1927), pp. 289–302*).—In continuing the study of the inheritance of white markings on the head of cattle (E. S. R., 50, p. 731), the author presents new data to indicate that at least four pairs of factors are operating, and that their interaction or the effect of inhibiting factors is more complicated than at first appeared.

Inheritance of plumage color in the Rhode Island Red breed of domestic fowl, F. A. Hays (*Genetics, 11 (1926), No. 4, pp. 355–371*).—The results of three years' breeding experiments at the Massachusetts Experiment Station, in which Rhode Island Reds were mated with recessive whites to determine the genetic constitution of a standard Rhode Island Red color pattern, are reported.

The results indicate that three factors are chiefly concerned with the common patterns, i. e., B, an autosomal gene for bay pigment which is epistatic to gold, L, a sex-linked pattern factor which influences the distribution and intensity of pigment, and E, an autosomal gene determining smutty color in feather fluff. The undesirable smutty color occurs when B, L, and E come together in the same zygote, and when L and E are present the smutty undercolor results, but does not occur when genes B and E are brought together. The true standard color male is represented by four genotypes, $BBLLee$, $BBLlee$, $BBllEE$, and $BBllEe$, and the female by three genotypes, $BBLoee$, $BBloEE$, and $BBloEe$.

Inheritance of black pigment in Silky fowls [trans. title], C. Wriedt (*Hereditas, 9 (1927), pp. 223, 224.*)—In crossing Silky males with Mille Fleurs hens, the black pigment of the former was found to be dominant to the gray of the latter. Nine chicks were produced from a cross of an F_1 Silky×Mille Fleurs cock and a Brown Leghorn hen. The 3 males showed the yellow pigment in the shanks, beak, and skin, while none of the 6 females showed this pigmentation. Three showed the black of the crossbred parent and 3 the gray of the Mille Fleurs, thus indicating the sex linkage of yellow.

Studies on inheritance in pigeons.—VI, Number of tail feathers and uropygial gland, I. Johansson (*Genetics, 12 (1927), No. 2, pp. 93–107, figs. 4*).—The results of studies of the inheritance of the number of tail feathers and the presence of the uropygial gland, based on the records of pigeon breeding experiments at the Wisconsin Experiment Station, are reported in continuation of this series (E. S. R., 55, p. 327).

Among 1,891 ordinary pigeons on which the number of tail feathers were recorded, there were 1,799 with 12 feathers, 60 with 13, and 26 with 14. Six had less than 12, which are considered to be errors in observations. Studies of the pedigrees indicated that the modifications to 13 and 14 tail feathers behaved as hereditary characteristics, but the mode of such inheritance was not determined.

Among 1,360 ordinary pigeons on which the presence or the absence of the uropygial gland was recorded, there were 1,353 in which the gland was present, though much variation in its size was observed. Five of the 7 showing an absence of the gland were found to be in one breeding line. All of the six birds for which the sex was recorded were males. The number of tail feathers and the presence of the glands were recorded in crosses between ordinary pigeons, all but one having 12 tail feathers and uropygial glands, and Fantail pigeons which varied in the number of tail feathers for the breeding animals from 25 to 31. The number of tail feathers varied in the 16 F_1s from 14 to 24, with the largest number, 4, having 14, and all but 2 had uropygial glands. The 18 F_2s produced from matings of F_1s with 22 tail feathers varied in the number of tail feathers from 14 to 24 and the oil gland was absent in 7. Among 75 offspring produced by mating F_1s to ordinary pigeons, the range in the tail feather count was from 12 to 17, and the uropygial gland was classified as normal in 45, small in 23, and absent in 7.

It was concluded from these and other crosses that while there was some tendency for the normal number of tail feathers to be dominant, at least three or four factors are responsible, the interaction of which is not simple. The presence of normal oil glands appears to be dominant, and its absence though common in the fantail breed is not definitely correlated with the number of tail feathers.

Arbitrary eye pigmentation in albino mammals [trans. title], W. Schultz (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 109 (1927), No. 2, pp. 287–290*).—The author describes experiments in which pigmentless eyes from young albino rabbits developed melanotic pigment when transplanted into relatively cold positions in the ears. It is suggested that the kind of pigment which develops depends on the color genes carried by the individuals which are suppressed by albinism.

Linkage studies on mice, W. L. Wachter (*Genetics, 12 (1927), No. 2, pp. 108–114*).—Data from linkage experiments with mice carried on at the Bussey Institution indicate that the factors for brown and dilution segregate independently of the factors for black-eyed white and piebald spotting.

Experimental study of ovarian regeneration in mice, H. O. Haterius (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 8, pp. 784–786*).—Of 76 female mice which were subjected to ovariotomy at the Iowa State University, 6 showed regeneration of ovarian tissue within 16 weeks after the operation. In 2 of these cases the completeness of the operation was uncertain, and it is assumed that small portions of ovarian tissue remained in the others, leading to the conclusion that no regeneration occurred within from 8 to 16 weeks after the operation provided the removal of the ovaries was complete. In other cases where bits of ovarian tissue were probably left, the ovaries regenerated to nearly normal size within 5 weeks.

New experiments on ovariotomy and the problem of sex inversion in the fowl, L. V. Domm (*Jour. Expt. Zool., 48 (1927), No. 1, pp. 31–173, pls. 12*).—This is a more detailed report, including additional observations, of the studies previously described (E. S. R., 53, p. 832). The work is presented in three sections, dealing with the cases of complete ovariotomy, incomplete ovariotomy, and secondary operations. A striking result of the study has been the high degree of acquisition of male characters in the majority of the castrated females, not only in the feathering but in the characteristics of the comb, wattles, ear lobes, spurs, and behavior.

In the 102 cases of complete ovariotomy, considerable variation was apparent, due to the character and degree of compensatory hypertrophy of the right rudimentary gonad which always follows ovariotomy. The organ formed is

testis-like in form and structure, but does not produce germ cells. The differences in the character and degree of the hypertrophied gland are due to the variability in the embryological composition of the rudimentary gonad. The rudiment of the right oviduct showed no definite response to the gonadal condition, but the rudimentary vas deferens, which is probably present in all females, responded to the testis-like gonads by growth and coiling. The type of plumage, molt, spur development, behavior, and size were somewhat variable, evidently depending upon the degree and nature of development of the rudimentary gonad.

The 23 cases of incomplete ovariotomy, in which there was regeneration of the ovary or formation of an ovotestis, constitute a graded series in the gonad dependent characteristics from those of the normal female type to those of the completely gonadectomized bird. This series corresponds to the nature, rate, and degree of gonad tissue formed, and therefore furnishes evidence of the sex specific qualities of the male and female hormones.

The secondary sexual characteristics of the 14 birds in which secondary operations were performed, removing all gonadal tissue, were similar to capons except in size. The lack of size probably resulted from the fact that the secondary operations were performed at an advanced age.

The present status of the problem of "sex-inversion" in the hen, F. R. Lillie (*Jour. Expt. Zool.*, *48* (*1927*), *No. 1*, *pp. 175–196*).—From a summary of the above paper and related investigations, the author presents the following conclusions:

"The working hypothesis to which we are led by Domm's results is, negatively, that there is no inversion of cells involved in the transformations that follow ovariotomy in the hen, or, positively, that the cells follow their embryonic determination throughout the entire series of transformations. Phenomena of induced growth are alone involved, except where double potentialities exist, as in the cells of the feather germs, for instance, or (presumably) those of the nervous system that condition overt behavior, which retain the embryonic quality of reacting in one of two fixed ways to induction. Until the implications of this working hypothesis are followed further, it seems useless to pursue the inquiry into the more fundamental questions of sex determination, which appear to be hardly at all affected, unless by way of definition, by the series of phenomena under consideration. It can hardly be too strongly emphasized that the physiological method of approach so far concerns only problems of sex differentiation, and not at all those of sex determination. The inquiry concerns the capacities of the sexes, not at all their origin."

The lay of the "rooster," L. J. Cole (*Jour. Heredity*, *18* (*1927*), *No. 3*, *pp. 97–106*, *pl. 1*, *figs. 4*).—An account is given, from the Wisconsin Experiment Station, of a bird with characteristic plumage of a Brown Leghorn male, but with feminine shaped body and comb, and which, when mated with a normal rooster, laid eggs which were found to be fertile. Feathers plucked from this bird were replaced by others of the female type, and after molting she appeared as a normal hen. It is assumed that the male plumage was associated with a disturbance of the ovarian function, which later became normal. Eggs were then produced and the normal female type of plumage resulted after molting.

FIELD CROPS

Some applications of biometry to agronomic experiments, C. H. Goulden (*Sci. Agr.*, *7* (*1927*), *No. 10*, *pp. 365–376*, *figs. 3*).—This is largely a discussion of Student's method for determining probable error and its application and of criticisms of Student's method by others. The use of the probable error of a

series of averages as advocated by Hayes (E. S. R., 54, p. 731) is also commented on.

Symposium on "crop rotation," W. W. Weir et al. (*Jour. Amer. Soc. Agron., 19 (1927), No. 6, pp. 517–567*).—The papers included in this symposium have been listed earlier (E. S. R., 55, p. 800).

As summarized by Weir, the facts presented point to several distinct rotation principles. Soil fertility can best be maintained when intertilled, small-grain, and grass or legume crops are grown in the order named and in recurring succession on a given area of land. Soil conditions and characteristics determine in a large degree what crops are best adapted to a particular soil. One kind of crop affects to a greater or less degree the growth of another crop which follows it.

Crop rotation in relation to southern agriculture, M. J. Funchess (*Jour. Amer. Soc. Agron., 19 (1927), No. 6, pp. 555–566*).—Data presented in this contribution from the Alabama Experiment Station suggest that the chief value of crop rotation is determined quite largely by the legumes in the rotation, and that the production of legumes may depend extensively on the addition of mineral fertilizers and lime. Maintenance of crop yields, control of weeds, insects, and diseases, and prevention of soil erosion, the probable benefits from crop rotation, are discussed in order.

Grazing indicators, L. B. Kulkarni (*Indian Sci. Cong. Proc. [Calcutta], 13 (1926), pp. 223, 224*).—Grazing indicators observed during investigation on pasture renovation in the Bombay Deccan included *Aristida funiculata*, a distinct indicator of the poor, rocky soil of the Bombay Deccan. It is preceded by *Tripogon roxburghii* and followed by *Andropogon contortus* (annual), a somewhat better indicator of poor soil than *A. funiculata*. *A. contortus* (perennial) which follows, generally occupying fairly good soils of the Deccan pastures, is indicative of overstocking and overgrazing. *Rottboellia exaltata*, usually found on heavy clays, indicates imperfect drainage and disappears when this condition is improved. *Eragrostis cynosuroides* and *Ischaemum rugosum*, found on deep clay soils of the rice areas, indicate the imperfectly drained condition of the soil caused either by an impenetrable subsoil or the hardened surface layer resulting from overstocking during the wet season.

The culture and manuring of fodder crops (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Conferences, No. 2 (1926), pp. 40*).—Papers presented at the Rothamsted conference on March 30, 1926, embraced Rothamsted Experiments on the Manuring of Fodder Crops, by J. Russell; The Cultivation and Manuring of Swedes and Kale, by W. A. C. Carr; Forage Crop Mixtures, by J. C. Brown; and Mangolds and Sugar-Beet, by C. Heigham.

[Crop experiments in Indiana] (*Indiana Sta. Rpt. 1926, pp. 35, 41–45, 53, figs. 2*).—Seed potatoes on which the sprouts appeared first at the bud end were comparatively free from mosaic and yielded about twice as much as seed which sprouted at every eye simultaneously. The latter was badly infected with mosaic and leaf roll. Certified seed almost doubled the yield of common seed at the Moses Fell Annex Farm.

Application of manure and a moderate quantity of fertilizer in the rotation, corn, wheat, and clover, resulted in substantial yield increases for all crops. A similar sequence produced much higher yields than one in which timothy replaced the clover. Crop values were highest in those rotations including more than an ordinary proportion of legumes.

Sudan grass has surpassed millet and soy beans as an emergency hay or pasture crop. It seemed to have a wide range of soil adaptation, although it did best on good corn land. If seeded before June 30, two cuttings for hay are possible. Drilling solid 32 lbs. of seed per acre about June 1 has given

the best hay and seed yields. In cultivated drills the most seed was obtained from 14-in. rows and a 16-lb. rate.

[Crop experiments at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 143 (1927), pp. 6, 7*).—Leaders in continued varietal tests, 1922–1926 (E. S. R., 56, p. 132), included Purkof wheat, Mammoth Winter rye, common barley, Dunfield soy beans, Johnson County White and Alexander Gold Standard corn, and Minota oats. Pasture improvement tests and alfalfa hay production are described briefly.

Farm crops (*Michigan Sta. Rpt. 1926, pp. 7, 8*).—Results of cultural tests suggested closer than the usual spacing for sugar beets, about 80 lbs. per acre in seeding kidney beans, June 1 to 7 for seeding Robust and other late beans, and as late as June 16 for the earlier sorts, and 28- or 30-in. rows. With a well prepared seed bed and weeds under control two cultivations were as good as more with field beans. Potatoes gave best results with early June planting, at 3- to 5-in. depths, and in from 12- to 15-in. spacing in 3-ft. rows. Promising crop varieties are indicated.

[Field crops work of the Umatilla Field Station, Hermiston, Oreg., in 1923, 1924, and 1925], H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 422 (1927), pp. 6–12, 20, figs. 2*).—Further experiments with field crops (E. S. R., 53, p. 334) are reported on.

Declining yields of alfalfa on the project are ascribed to winterkilling, bluegrass and weed encroachment, and deterioration of irrigation systems. Grimm, Black Hills common, and local common gave the highest yields among the alfalfa varieties. Strains of Grimm and Turkestan showed high resistance to winterkilling.

Alfalfa on plats receiving no manure and manure at rates of 8 and 32 tons per acre during 6 of 11 years (totaling 48 and 192 tons) averaged 3.71, 5.07, and 6.1 tons of hay, respectively. The lighter dressing has given increased returns at the rate of 0.311 ton of hay per ton of manure and the heavier 0.137 ton per ton of manure. Alfalfa yields were maintained during the experiment. The yields of green corn fodder from these plats showed a similar trend. Since the increases in yield per ton of manure were practically the same for alfalfa and for corn, the manure was evidently more valuable when applied to alfalfa than when applied to corn because of the higher feeding value of the alfalfa. Alfalfa yields were not increased by commercial fertilizers, although the crop responded to sulfur on the heavier soils.

Sand bur (*Cenchrus tribuloides*), the most serious weed pest, seems to be spreading rapidly. It may be controlled by close pasturing or by growing cultivated crops. Spring-tooth harrowing between crops of alfalfa did not control sand bur in hay fields.

Yellow Strassburg, Triumph, and Nancy Hall led the sweet potato varieties in a 1-year test.

[Field crops work in Tennessee], J. A. McClintock, C. A. Mooers, L. R. Neel, L. S. Mayer, S. H. Essary, and C. D. Sherbakoff (*Tennessee Sta. Rpt. 1926, pp. 17, 18, 23, 25–28, 30, 40, 41, figs. 3*).—Brief statements are given in regard to the progress and results of planting tests with potatoes, sweet potatoes, and soy beans, fertilizer and nutrition studies with tobacco, improvement work with corn, cotton, and lespedeza, weed control investigations, and delinting experiments with cotton seed (E. S. R., 56, p. 435).

[Field crops investigations in India, 1925–26] (*India [Dept. Agr.] Rev. Agr. Oper., 1925–26, pp. 2–38, 43–49, pls. 7, fig. 1*).—Investigations (E. S. R., 55, p. 826) conducted by the imperial and provincial departments of agriculture in numerous centers in India with rice, wheat, cotton, sugar cane, jute and

other fibers, tobacco, oil seeds, fodder crops and grasses, sorghum, ragi, potatoes, and legumes are reviewed for the year 1925–26.

Inoculation of alfalfa on lime-deficient sandy soils: Soil transfer vs. use of cultures, F. J. ALWAY and G. H. NESOM (*Minnesota Sta. Tech. Bul. 46* (*1927*), *pp. 62, figs. 10*).—Investigations on the growth of Grimm alfalfa were made on six widely distributed sandy fields in Minnesota, all more or less lime deficient for both alfalfa and sweet clover and on which the pH of the surface soils was between 5 and 6.

On land limed well in advance of seeding artificial cultures were as effective as a heavy application of soil from an established field of alfalfa or sweet clover, whereas on unlimed soil the soil transfer method greatly excelled in the case of the first seeding. Increasing the culture to 5, 10, or 30 times the usual rate did not render it as effective as soil transfer. The difference between the methods appeared to increase with the lime deficiency of the land. Alfalfa sown after crops of alfalfa or sweet clover on such unlimed soils was satisfactorily inoculated.

When inoculated by soil transfer or by previous growth of alfalfa or sweet clover paying crops of alfalfa may be grown on these soils without lime. While liming generally increased the yields more or less, even with satisfactory inoculation by one of the methods cited, the increase actually due to liming independent of its influence on inoculation may be too small to be profitable, and during drought the beneficial effect may be masked entirely.

Corn varieties in Arkansas, C. K. MCCLELLAND (*Arkansas Sta. Bul. 217* (*1927*), *pp. 53, figs. 2*).—Corn varieties (E. S. R., 55, p. 30) are recommended for different sections of Arkansas as the result of extensive varietal trials at the station and elsewhere in the State. Standard northern varieties and improved strains do well in the better seasons and more northern or elevated sections, but are often surpassed by western sorts bred for drought resistance. Southern single-ear varieties have been only fair, Mexican June being the outstanding corn in the group. While they did not always excel varieties of other groups, southern prolifics have generally given good results throughout the State and under varying conditions.

Cultivation experiments with corn, M. NELSON and C. K. MCCLELLAND (*Arkansas Sta. Bul. 219* (*1927*), *pp. 26*).—Prolonged cultivation experiments with corn (E. S. R., 55, p. 121; 56, p. 332) showed that delaying cultivation for 6 weeks or more after planting resulted in decided decreases in yield, even though weeds were hoed back to protect the corn plants. Apparently any neglect of the corn plant after it has begun to grow can be accompanied only by reduced yields. In comparisons of methods best results were had from a medium depth of cultivation laid by deep when corn was waist high. Destruction of weeds seemed to be the chief object in the cultivation of a growing crop.

[Cotton investigations in the Union of Socialistic Soviet Republics] (*Glav. Khlopkov. Kom. S. S. S. R., Bibliot. Khlopkov. Dela, No. 6* (*1927*), *pp. 250, figs. 74*).—This number embraces articles the translated titles of which are as follows: The Question of Cotton Premium, Judging, and Standardization and The Basis for the Standards for the 1925–26 Cotton Crop, both by M. G. Erofeev (Erofeef); Summary of Ginning Work in 1925–26, by A. M. Shlosberg (Schlossberg); Gin Buildings, by E. A. Gustavson; A Method for Measuring the Length of Cotton Fibers, by W. L. Balls, trans. by N. T. Pavlov (Pavlof); Comparison of the Balls and the Johannsen Sorters (with Eng. abs.), by V. E. Zotikov (Sotikof); Investigation of the Waste on Openers and Cards, by N. T. Pavlov (Pavlof); Investigations on the Fiber of Improved Cotton Varieties (with Eng. abs.) and Cotton Defects (with Eng. abs.), both by K. A. Chapkovskii

(Chapkovsky); Analysis of the Technological Process of Cotton Ginning and Cleaning (with Eng. abs.), Method of Determination of Gin Saw Production, and Automatic Gin Feeders, all by V. S. Fedorov (W. S. Fedorof); The Merits of Cotton Presses for Round Bales (with Eng. abs.), by L. N. Chaplygin (Chapligin); and The Work of Rams in Cotton Presses and Rationalization of Cotton Pressing, both by F. A. Drûzhev (Dujef).

Cotton, S MILLIGAN ET AL. (*So. and East African Agr., Cotton, Ent., and Mycol. Conf., Nairobi, Proc., 1926, pp. 117–164, 312–322*).—Cotton problems discussed at the conference of East African Dependencies held at Nairobi, Kenya, in August, 1926, included experimental methods, improvement work, cultural practices, varieties, seed production and control, insects and diseases, and marketing.

Dry land cotton culture in French West Africa [trans. title], PERSÉVÉRER (*Acad. Sci. Colon. Ann., 2 (1925), pp. 13–66, pls. 4*).—This memoir describes the zones favorable to cotton production without irrigation, and the importance of the industry, the species grown, cultural methods, improvement practices, and insects and diseases. Economic problems and producers associations are also discussed.

Occurrence of branched hairs in cotton and upon Gossypium stocksii, W. YOUNGMAN and S. S. PANDE (*Nature [London], 119 (1927), No. 3003, p. 745, figs. 2*).—Branched fibers (E. S. R., 57, p. 96) have been observed in upland American and sea island types of cotton. Many fibers, both upon the seed coat and capsule wall of *G. stocksii*, showed branching. Some of the peculiarities of *G. stocksii* are noted briefly.

The importance of cotton breeding to the spinner, S. C. HARLAND (*Textile Recorder, 45 (1927), No. 531, p. 87*).—The effect of climate and other environmental and hereditary factors in determining the quality and quantity of cotton is discussed, and ways to reduce variability in measurable characters and neppiness by the application of genetic methods are indicated. In a study of the effect of varying water supply on the character of the staple, by F. S. Parsons at the Imperial College of Tropical Agriculture, with excessive water the individual fibers became long and thin walled, while with deficient water the fibers were greatly shortened and thickened with a considerable proportion of dead, half-grown seeds bearing immature fibers. This work tentatively suggests that the small fiber weight and consequently neppy character of the Punjab-American cottons is possibly due to excessive water.

Maintenance of purity of the improved cottons, R. PRASADA (*Allahabad: United Prov. Dept. Agr., 1927, pp. 14*).—The method suggested provides that improved seed from the research station be multiplied and rogued on seed farms and on farms of controlled cultivators, respectively, before turning it over to the cotton grower.

Some effects of late defoliation on cotton, C. A. LUDWIG (*South Carolina Sta. Bul. 238 (1927), pp. 23, figs. 11*).—Observations on cotton in dry and in moderately and heavily irrigated plats with plants normal and also defoliated either August 20 or September 10, 1925, showed that defoliation reduces the yield both in size and number of bolls if done long enough before maturity. Lint from plants defoliated early was generally weaker and graded lower than that from plants defoliated late, which in turn was considered inferior to the produce of normal plants, particularly in the late pickings. Differences in staple length were not significant provided the lint was not gin cut. Late defoliation on moist soil resulted in the death of most of the branches and many plants, but this did not happen on dry soil or with early defoliation. Defoliation seemed to delay rather than hasten maturity, and the harmful effects on yield and rate of maturity appeared to increase according to the

earliness of defoliation before the crop ripens. Attacks of leaf-eating insects such as the cotton leaf worm should be regarded only as misfortune.

[Flax retting investigations at the Michigan Station] (*Michigan Sta. Rpt. 1926, p. 16*).—When pure cultures of efficient retting organisms (E. S. R., 55, p. 896) were added in large quantities to the solution the retting process was hastened to a certain extent. However, the control of the acidity of the retting bath was found to be a more promising method. The acidity at which retting takes place seemed to have a pronounced influence on the quality of the flax, excessively acid or alkaline baths being conducive to harshness of fiber.

Lantana (*India [Dept. Agr.] Rev. Agr. Oper., 1925–26, p. 60*).—Extensive trials in Bombay (E. S. R., 54, p. 231) showed that lantana could be controlled by cutting down the bush and painting the stump with sodium arsenate. This method is reported to have given 94 per cent of successes when tried on a large scale under jungle conditions. Recutting and repainting of sprouted surviving plants with sodium arsenate completely wiped them out. Chemical analysis showed that the arsenic penetrated the plant and reached the smaller root branches.

Oats, C. and H. DENAIFFE, COLLE-DENAIFFE, and E. SIRODOT (*L'Avoine. Carignan (Ardennes): Denaiffe & Sons, 1927, 2. ed., pp. VI+557, pl. 1, figs. 124*).—Written largely from the viewpoint of France, this volume gives information on the history and acreages of the crop and describes common oats and the principal varieties of France and their grain, with appropriate determinative keys. The principal species pertaining to Avena are also grouped. Environmental, soil, and cultural requirements are pointed out, and field, harvesting, and cleaning practices are outlined. The concluding chapters deal with seed and yields, physical and chemical composition and utilization, diseases and insects, weeds, and marketing.

Colonial crops.—Oil seed plants, H. JUMELLE (*Les Cultures Coloniales.—Plantes Oléagineuses. Paris: J.-B. Baillière & Sons, 1927, 3. ed., vol. 5, pp. 112, figs. 48*).—A revision of the work noted earlier (E. S. R., 33, p. 437).

Poa bulbosa, H. L. WESTOVER and O. B. FITTS (*Bul. U. S. Golf. Assoc. Green Sect., 7 (1927), No. 4, pp. 78–83, figs. 3*).—Information is given on the habits and cultural needs of *P. bulbosa*, said to be of value as a winter grass for fairways and lawns.

Peculiarities and anomalies of potato flowers as varietal characteristics [trans. title], E. L. KLAPP (*Pflanzenbau [Berlin], 3 (1926), Nos. 7, pp. 101–105, figs. 11; 8, pp. 114–117, fig. 1*).—The relative values of blooming ability, character of inflorescence, buds, calyx, and anomalies of the corolla and other flower parts are discussed with respect to use in differentiating cultivated potato varieties.

Storage tests with sugar beets [trans. title], S. KUDELKA and E. SCHOLTZ (*Ztschr. Zuckerindus. Čechoslovak. Repub., 51 (1927), Nos. 32, pp. 347–351, figs. 3; 33, pp. 365–368; abridged in Facts About Sugar, 22 (1927), No. 20, pp. 486, 487*).—Experiments were made to determine optimum storage conditions and the relative merits of different forms for piles of sugar beets. Beets containing about 17 or 18 per cent of sugar and weighing about 600 gm. each were stored in prismatic earth covered piles (1) 8 meters wide at the bottom, 2.7 meters wide at the top, and 3.3 meters high and ventilated, (2) of the same dimensions but unventilated, and (3) 4 meters wide at the bottom, less than 1 meter at the top, and 2.2 meters high, unventilated. Observations were made on beets inclosed in nets at different levels in the piles. The outside temperature during the test period, October 12 to November 21, averaged 11° C. (52° F.), ranging from 22.5 to −2°.

Observations on sugar losses, changes in the weight of beets, and temperatures at the test points indicated that temperature was the prime factor in keeping piled beets, temperatures as low as possible being desirable. Small piles protected from frost seemed more advantageous because the heat is dissipated naturally, whereas large piles, more easily protected against frost, are subject to considerable sugar loss in warm weather, although with proper ventilation they could combine the advantages of both large and small piles. Excessive aeration helped to increase sugar losses, but this was outweighed by benefits derived from the lowered temperature. The temperature rose toward the top of the pile.

During the first 14 days in other tests poorly topped beets exhibited no noteworthy losses of sugar, but during the 3 weeks following the loss exceeded that in well topped beets, suggesting that a process of continued ripening takes place when the beet has been improperly topped. Later on sprouts appear and use up considerable sugar for their vegetative growth. Small beets (averaging 236 gm.) seemed to have better keeping qualities than large beets (806 gm.). However, it was observed that in topping the larger beets are relatively the more damaged. In these investigations high quality beets rich in sugar did not keep as well as those with lower sugar contents. Practical suggestions derived from the experiments are outlined for the storage of sugar beets.

The variety P. O. J. 2725 in Tucumán, W. E. CROSS (*Planter and Sugar Manfr., 79 (1927), No. 1, pp. 1, 2, fig. 1*).—P. O. J. 2725, a stout, light green cane with exceptionally broad leaves derived from Batjan×P. O. J. 2364 (Kassoer× P. O. J. 100), appears as good for Tucumán conditions as the commonly planted P. O. J. 36 and 213 and has a heavier stalk, a lower fiber content, and is much softer. It has a high degree of resistance to mosaic, and in contrast to the Java varieties usually grown in the province does not deteriorate or invert after cutting, except in a very minor degree. Experiments showed that this variety covered with trash after cutting could be kept a month before milling with practically no inversion.

The P. O. J. 2725 sugar cane [trans. title], W. E. CROSS (*Rev. Indus. y Agr. Tucumán, 17 (1927), No. 9–10, pp. 213–227, fig. 1*).—The behavior of this sugar cane variety in Tucumán is reported in greater detail than in the above account.

Sweet clover, C. J. WILLARD (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 107–114, figs. 2*).—Experiments and observations during four years at the Ohio State University showed that cutting first-year clover in the fall reduces the amount of material stored in the roots, and thus lessens the soil improving and pasture value of the crop the next season. Cutting in late September reduced the nitrogen available as green manure in the next April more than one-half. Liability to winterkilling by heaving was greatly increased. The loss is less the better the growth made before cutting and the later the cutting. Clipping first year sweet clover in August is not desirable unless absolutely necessary to kill weeds.

[Tobacco studies in Sumatra], J. VAN DER POEL (*Meded. Deli Proefsta. Medan, 2 ser., Nos. 46–47 (1927), pp. 18, figs. 3; Eng. abs., pp. 10, 18*).—Deli tobacco shrunk from 6.3 to 10.9 per cent, averaging 8.5 per cent, in length and about 15 per cent in breadth during the drying process. The extent of shrinkage seemed to depend on the position of the leaf on the stem, lower leaves shrinking more than upper ones. Shrinkage was higher when the leaves were harvested after rainy weather and less after drought. Tobacco seed germinated well in pH-ion concentration from 5.6 to 7.8.

The relation of the carbohydrate and phenol content to color and quality in tobacco [trans. title], A. SHMUK (SCHMUCK) and V. SEMENOVA

(*Trudy Tsent. Inst. Opytn. Tabakovod.* [*Krasnodar*] (*Cent. Inst. Tobacco Invest. Bul.*) *No. 33* (*1927*), *pp. 22; Engs. abs., p. 21*).—Investigations reported indicated that the contents of true carbohydrates and other compounds, probably polyphenols, vary widely in different classes of tobacco. The phenols rather positively influence the quality, and in some cases the aroma, whereas the color of a given sample appears closely related to the carbohydrate content. The absolute content of phenols showed very little relation to color.

Triticum aegilopoides, BERKNER and K. MEYER (*Pflanzenbau* [*Berlin*], *3* (*1927*), *No. 19, pp. 298–301, fig. 1*).—The occurrence of *T. aegilopoides* and its habitat are indicated, with a brief synopsis of forms observed in material from Asia Minor.

Aegilops forms [trans. title], K. MEYER (*Pflanzenbau* [*Berlin*], *3* (*1927*), *No. 19, pp. 301–305, figs. 10*).—The morphological and cytological characteristics of Aegilops and Triticum are compared, and a synopsis of Aegilops species is given.

Protein as a wheat price factor, H. HEDGES (*Nebraska Sta. Bul. 221* (*1927*), *pp. 11*).—A survey (questionnaire) among Nebraska millers showed that the protein test is used extensively by both large and small mills. It was considered a fairly dependable indicator of baking quality, although supplementary check tests are held necessary. About 40 per cent of the mills regularly used gluten determinations, but most did not employ them at all. Lack of accuracy was the main objection to gluten determinations. Practically all Nebraska mills made at least some use of experimental baking. Most of the mills indicated protein as the best evidence of the baking quality of wheat at the time of purchase, although a considerable number chose gluten. While the adoption of the protein content as a market price factor seemed fully justified, and premiums were paid by millers for high protein wheat, it was observed that in relatively few cases were the premiums fully reflected back to the individual producers of high protein wheat.

Agricultural seed (*Kans. State Bd. Agr.* [*Quart.*] *Rpt., 46* (*1927*), *No. 181–B, pp. 37, figs. 11*).—The average results of tests on 5,806 samples of agricultural seed received at the Kansas Seed Laboratory during the year ended June 30, 1926, are tabulated, together with the text of the Kansas seed law effective July 1, 1925, regulations thereunder, and information on the identification of weed seed.

The bindweed, E. G. SCHAFER (*Washington Col. Sta. Pop. Bul. 137* (*1927*), *pp. 19, figs. 6*).—A popular discussion of the damage caused by bindweed (*Convolvulus arvensis*), the characteristics of the plant, its ways of spreading, and control and eradication methods. Close pasturing with sheep or hogs may keep the weed in check on small areas, while seeding to alfalfa may hold it in subjection on larger areas. Clean cultivation (E. S. R., 56, p. 525) and chemicals may be of certain value in eradicating the weed.

Prickly pear: Botanical description, history, and the problem the plant presents, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 38* (*1927*), *Nos. 4, pp. 311–316; 5, pp. 383–388*).—A review of the prickly pear problem in Australia, given before the Sydney University Botanical Society in a lecture entitled Cactaceae: Methods of Destroying Opuntias, describes the botanical characteristics and relationships of *Opuntia* spp., lists species wild in Australia, and summarizes the results of attempts to utilize the pest and to control it by means of mechanical devices, chemicals, insects, and other natural enemies.

Sulphuric acid as a weed spray, A. ÅSLANDER (*Jour. Agr. Research* [*U. S.*], *34* (*1927*), *No. 11, pp. 1065–1091, figs. 5*).—In experiments at the New York Cornell Experiment Station field mustard (*Brassica arvensis*) plants grown with Cornellian oats (*Avena sativa*) in greenhouse pot cultures kept at 15, 30,

and 45 per cent of the moisture-holding capacity of the soil were sprayed when they had developed four leaves with solutions of iron sulfate and of sulfuric acid ranging in strength from 5 to 15 per cent and from 1 to 2 per cent, respectively, at the rate of 107 gal. per acre and were then exposed to conditions of about 30, 60, and 100 per cent relative humidity. The sprays did not harm the oats plants.

Iron sulfate solutions were most destructive at about 100 per cent relative humidity, a 5 per cent solution completely killing mustard in 24 hours, whereas in dry air, 30 to 60 per cent relative humidity, the solution evaporated and deposited crystals on the leaves without injury. However, with an increase of the relative humidity to about 100 the plants were soon killed. Solutions up to 15 per cent were similar in effect.

Mustard plants were killed by sulfuric acid solutions under all humidity conditions, best results being had in dry air. Plants in moist and in dry soil were killed by 1.5 and 2 per cent solutions, respectively. The acid spray is evidently to be recommended for dry regions. A 2 per cent sulfuric acid solution killed plants in 1 hour at 30° C. and only after 5 hours at 6°. Slower evaporation evidently made the 15 per cent iron sulfate solution more effective at the lower than at the higher temperature. Plants (temperature 20°, relative humidity 65 per cent) sprinkled with water 1 hour after the application of 2 per cent sulfuric acid solution died, whereas those sprayed with 15 per cent solution of iron sulfate were almost unharmed when the spray was washed off 3 to 6 hours later.

Protoplasmic streaming in the leaves of water weed, *Elodea canadensis*, continued for 2 hours in a 10 per cent iron sulfate solution but stopped in 30 seconds in a 1 per cent sulfuric acid solution. Cells were killed after retention in the iron sulfate solution for 3 hours or in the sulfuric acid for 2 minutes.

Analyses of mustard plants indicate that the great resistance to sprays exhibited by plants in the late rosette stage can not be explained by the increased quantity of ash and dry matter in the upper leaves.

A Prince Edward Island weed survey, G. Groh (*Sci. Agr.*, 7 (1927), No. 10, pp. 388–395).—An extensive list of native and introduced species of weeds is published as the result of a survey on Prince Edward Island. Canada, during July of 1926.

HORTICULTURE

[Horticultural investigations at the Indiana Station] (*Indiana Sta. Rpt. 1926, pp. 34, 35, 36, figs. 2*).—This report as usual (E. S. R., 55, p. 36) is comprised of brief progress notes.

In the Laurel experiment in orchard management, terminated during the year, tillage-cover crop and straw mulch systems appeared superior to grass treatments. Where nitrogen fertilizers were used to supplement grass mulch the yields were increased. Nitrogen proved of greater benefit on grass and grass mulched areas than under tillage or straw mulch. Tilled trees without sufficient cover crop during the past 5 years were less productive in 1925 than trees receiving nitrogen.

In pruning studies with Grimes apple trees light pruning continued to give the best results. Pruning out the tops of previously nonpruned trees failed to give any increase in yield. In peach pruning studies thinning of the branches with light heading back has given more satisfactory results than heavy heading back. At the Moses Fell Annex Farm the Rochester, Gold Drop, Belle, Champion, and Heath Cling peaches proved the most hardy in bud.

Apple storage investigations at Bedford showed that Grimes and Jonathan may be kept with the aid of ice and adequate ventilation for about one month

longer than without ice. The use of shredded oiled paper protected Grimes from storage scald.

Satisfactory progress was reported in tomato seed improvement studies. In canning studies preliminary observations indicated that the storage of tomatoes prior to canning has a direct influence on the quality of the product, high temperatures being exceedingly injurious. In tomato fertilizer studies it was found that fertilizers not only affect yields but also the quality, and that a deficiency in potash is a serious condition.

With sweet corn a complete fertilizer with the formula 2-8-10 (N-P-K) gave the largest total yields, but acid phosphate in equivalent amounts was almost as satisfactory as the complete fertilizer. Neither potash nor nitrogen applied alone gave profitable increases. Lime and barnyard manure also did not prove profitable. Strains of Country Gentleman selected by the station outyielded commercial strains to the extent of about 0.5 ton per acre. The grading of sweet corn seed was found to aid materially in promoting uniform ripening of the ears.

[Horticultural investigations at the Moses Fell Annex Farm, Bedford, Ind.], H. J. Reed and H. G. Hall (*Indiana Sta. Circ. 143 (1927), pp. 9-12, figs. 2*).—In a test of 14 peaches Rochester, Gold Drop, Belle, Crosby, Champion, and Heath Cling appeared most hardy in the bud. Records taken on apples stored in a ventilated cellar showed Grimes and Jonathan to keep well until after Christmas, while Rome, York Imperial, and Winesap kept successfully until late spring. The use of ice and electric fan ventilation reduced the temperature 12 to 15°, and in this environment Grimes and Jonathan apples kept in salable condition about 1 month longer. Nitrates gave good profits when applied to trees in sod but not with trees under cultivation.

Sweet corn, G. E. Starr (*Michigan Sta. Circ. 105 (1927), pp. 19, figs. 9*).—Consisting for the larger part of general cultural information, this circular presents also results of variety tests in 1924 and 1925. Earliest of All, first to mature ripe ears in both years, required 62 days to reach this stage as compared with 96 days for the slowest maturing varieties. The selection and care of sweet corn seed are discussed in some detail.

Annual variation in apple yields: A possible cause, R. C. Collison and J. D. Harlan (*New York State Sta. Tech. Bul. 126 (1927), pp. 16, figs. 3*).—Correlating the yields, individual and collective from 1908 to 1923, inclusive, of 50 Rome apple trees, all descended from a single parent and comprising part of a long-continued fertilizer study at the station, with the temperature and precipitation during the same period, it was found that rainfall departures from normal have been an important factor in influencing annual yields. Temperature departures, on the other hand, had no such marked influence. In respect to moisture, the 6 weeks from July 16 to September 1 were found most critical, and by partial correlation it was shown that of these 6 weeks the first 2 in August were most important, suggesting that special care should be taken to conserve moisture in this period, particularly in dry years. An analysis of the data on individual trees showed marked variations in response to rainfall despite the fact that the trees were so closely related. It is suggested that the reason for these fluctuations may possibly lie in the relation of the trees to subsoil water or in variations in ability to absorb water under similar conditions. It is considered possible that the moisture relationship may be concerned with more complex and indirect factors, the relationship of which to annual yields would be difficult to establish.

Golden Delicious apple: Its spraying, picking, and storage, C. W. Ellenwood (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 128-130*).—Finding that shriveling in storage is a distinct handicap to this otherwise promising apple

studies were instituted to determine the effect of diluting sprays, the time of picking, and the use of waxed papers for improving keeping quality. A substitution of hydrated lime for lime sulfur in the summer arsenate of lead combination spray resulted in a smoother skin. In respect to the date of harvest, the tests suggested that Golden Delicious should be picked from 10 days to 2 weeks later than Grimes Golden. Wrapping fruits in waxed paper or packing in shredded waxed paper aided materially in preventing shriveling.

An experiment in breeding plums, R. WELLINGTON (*New York State Sta. Tech. Bul. 127 (1927), pp. 61*).—This paper, essentially a summary of the results of 18 years of breeding investigations with plums and other drupaceous fruits, presents information on fruitfulness and sterility in selfs and crosses and upon the inheritance of fruit characters.

Crosses within and between *Prunus domestica* and *P. insititia* showed these two species to be largely self and intercompatible. Self and cross incompatibility was much more evident in *P. salicina*. Attempts to cross *P. domestica* with *P. persica*, *P. tomentosa*, and *P. armeniaca* gave completely negative results, and in the case of *P. salicina* almost negative results. Twenty-two crosses between varieties of *P. salicina* and *P. armeniaca* produced no seed. Minco, a *P. hortulana* variety, failed to set when crossed with *P. armeniaca*, *P. domestica*, and *P. salicina*, and Miner gave negative results when crossed with the peach.

In respect to the segregation of characters in seedlings, time of fruiting closely followed that of the parents. In no instances were large-fruited seedlings obtained from the crossing or selfing of small-fruited parents. On the other hand, large-fruited parents sometimes yielded small-fruited progeny. Three distinctive fruit shapes were noted, oval, round, and oblate, and though no definite inheritance of shape was found, it was observed that oval-fruited parents yielded various shaped progeny but that oblate-fruited parents produced only oblate-fruited seedlings. In respect to bloom on fruits, some indication was observed that thick bloom dominates thin bloom. In color, yellow behaved as a recessive to red, purple, and black. In respect to the inheritance of quality, deemed a difficult character to define, in every cross where a sufficient population was obtained to make significant records, inferior individuals appeared. The freestone character was apparently recessive to clingstone, freestones being obtained from cling and semicling parents.

Date culture in Egypt and the Sudan, S. C. MASON (*U. S. Dept. Agr. Bul. 1457 (1927), pp. 72, pls. 14, figs. 9*).—A survey of date production, discussing regions and status of date growing in each, describing varieties, methods of propagation, pollination, harvesting, marketing, use of by-products, etc.

The development of the pecan nut (Hicoria pecan) from flower to maturity, J. G. and N. C. WOODROOF (*Jour. Agr. Research [U. S.], 34 (1927), No. 11, pp. 1049–1063, figs. 10*).—Supplementing earlier papers upon morphological and physiological development of the buds and flowers of pecans (E. S. R., 57, p. 235), this contribution covers the changes taking place from the time of fertilization of the flower to maturity of the nut as determined by microscopic observations and chemical analyses. Fertilization occurred from 5 to 7 weeks following pollination, but the embryo was not observed until 10 weeks after pollination. The size of the nut was determined during the early and middle and the development of the edible portion during the later part of the growing season. Nuts partially or wholly unfilled at maturity may be traced in some cases to drought, frost injury, etc., and in certain varieties to overproduction.

Directions for the preparation of plant specimens submitted for identification, G. P. VANESELTINE (*New York State Sta. Circ. 92 (1927), pp. 3, fig. 1*).—Brief directions are given.

FORESTRY

[**Forestry studies at the Michigan Station**] (*Michigan Sta. Rpt. 1926, pp. 9, 10*).—Studies with basswood seeds suggested that the slow germination characterizing this species is due to an impervious seed coat and rudimentary embryo. Seeds lay dormant but viable for 4 years after planting. At the Dunbar Substation furrow planting of white pine proved most successful among methods employed.

Trees on the farm, W. L. QUAYLE (*Wyoming Sta. Circ. 20 (1927), pp. 4*).—Information is given on the planning and planting of forest trees for windbreaks and shade, with a list appended of trees available for distribution to farmers by the department of State experiment farms of the University of Wyoming.

The suitability of American woods for paper pulp, S. D. WELLS and J. D. RUE (*U. S. Dept. Agr. Bul. 1485 (1927), pp. 102, figs. 8*).—Following a discussion of standard pulping methods and of the chief pulping characteristics of hard and soft woods and of the methods of technique employed in this study, herein is presented a summary of the results of extended studies upon the suitability for paper manufacture of species growing on the national forests and of other species available for pulping but not commonly utilized. Extensive tables of cooking and strength data are appended.

DISEASES OF PLANTS

Practicum of plant diseases due to parasitic fungi, M. NOACK (*Praktikum der Pilzparasitären Pflanzenkrankheiten. Berlin: Paul Parey, 1926, pp. [4]+137, figs. 18*).—This introduction to the study of parasitic fungi causing plant diseases is intended to serve as a basis for both instruction and practical work.

Seeds as carriers of disease, C. R. ORTON (*Jour. N. Y. Bot. Gard., 27 (1926), No. 315, pp. 54–63, pl. 1*).—This abstract of an illustrated lecture delivered November 14, 1925, deals in a somewhat historical manner with the transmission of plant diseases by seeds and with preventive treatments. It is concluded that up to the present time certain of the organic mercury compounds offer the best means for seed disinfection.

Abortion in plant pathology [trans. title], A. TROTTER (*Ann. R. Scuola Super. Agr. Portici, 2. ser., 20 (1924), [Art. 1], pp. 11*).—A brief review is given of plant abortion or degeneration as dealt with under various designations by different authors named.

Immunity in plants [trans. title], J. MAGROU (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 3, pp. 189–192*).—The author has confirmed views of Bernard (E. S. R., 27, p. 224) as to the fungicidal capability of certain orchids, which, he thinks, may have significance in phytopathology.

The influence of soil treatment preparations on plant growth [trans. title], G. KORFF and F. OTTENSOOSER (*Arb. Biol. Reichsanst. Land u. Forstw., 15 (1926), No. 1, pp. 47–74*).—These tests employed about 44 preparations (which are styled technical) in soil treatments applied in containers or in the open field. Details and tabulations are presented. Complete suppression of fungus growth (which, however, is not held to be indispensable to increased yield) could not be completely and unobjectionably attained by use of any of the materials employed.

Chemical plant protective media, their employment and effects, E. VOGT (*Die Chemischen Pflanzenschutzmittel, Ihre Anwendung und Wirkung. Berlin: Walter de Gruyter & Co., 1926, pp. 134, figs. 12*).—Following an introduction by O. Appel on the agricultural significance of plant protection, this little book

presents, in systematic detail, the following subjects: Seed treatments (purposes and apparatus), sprays and dusts, soil disinfection, gas and smoke as fungicidal agents, control of rodents, and various plant protectives, with a review of the more important diseases and pests and costs of protectives and apparatus.

The fungicidal properties of certain spray fluids, IV, W. GOODWIN, H. MARTIN, and E. S. SALMON (*Jour. Agr. Sci. [England], 16 (1926), No. 2, pp. 302–317*).—The results are recorded of experimentation along the lines followed previously by Horton and Salmon (E. S. R., 50, p. 346). The fungus used was *Sphaerotheca humuli*, and the condition selected for spraying the powdery conidial stage produced on young leaves, at nodes 3 to 6, of rooted cuttings of *Humulus lupulus* grown in an unheated greenhouse.

A solution of potassium polysulfide containing 0.092 per cent of polysulfide sulfur proved fungicidal, a solution containing 0.066 per cent not completely so. A solution of sodium polysulfide containing 0.12 per cent polysulfide sulfur proved fungicidal, and apparently sodium and potassium polysulfide possess about the same value. Lead arsenate appeared much less fungicidal than lead thioarsenate, dicalcium arsenate, or disodium arsenate. Lead arsenate containing 0.1 per cent As_2O_5 was inadequate, though one containing 0.204 per cent proved fungicidal, as did also lead thioarsenate at 0.05 per cent As_2O_5. Solutions of calcium polysulfide and of lead arsenate at concentrations below fungicidal strength proved to be fungicidal when mixed together.

[Plant disease investigations at the Indiana Station, 1925–26] (*Indiana Sta. Rpt. 1926, pp. 23–25, figs. 2*).—Winter wheats said to have been outstanding for resistance to leaf rust included selections from crosses of Kanred with Gipsy, New Amber Longberry, Red Rock, Fulcaster, Valley, Michigan Amber, and Purple Straw. Selections from crosses of Webster and Norka showed the best results among the spring wheats.

In the corn disease investigations, additional hybrid strains resistant to root rot were produced, and tests showed that different strains are particularly adapted to different environments. Increased vigor of some hybrid plants is associated with lower iron and higher potassium content than is found in either parent, with the content of calcium, magnesium, silicon, and phosphorus intermediate between those of the parent lines. It is suggested that absorption of these bases is dependent upon heritable genetic factors. Tests of corn stalks and soil samples indicated that soil management was in many cases a more important factor than soil type in accounting for soil depletion. The general areas of potassium deficiencies were determined.

Apple blotch studies carried over six years have indicated that sprays applied at petal fall and two, four, and six weeks thereafter constitute a reliable schedule; that no later sprays are needed; that, except for the petal-fall spray, Bordeaux is superior to lime sulfur; and that a Bordeaux of 2–6–50 strength is effective, while lesser strengths are not reliable in certain seasons. Apple blotch can be completely eliminated in young orchards of susceptible varieties such as Duchess. If cankers are shaved off from the trees and blotch sprays applied each of the first four or five years after the trees are set, the disease is removed and the necessity of the annual blotch sprays eliminated. In 1926, in orchards thus treated, 11,673 fruits examined showed no infection.

A soy bean seed purple stain has been found to be caused by a fungus (*Cercospora* sp.), which invades the seed coat, but does not injure the cotyledons or embryo germinability. This disease is suspected to be identical with one recently reported from Japan.

Potato leaf roll and mosaic tests, followed by greenhouse tests, showed that leaf roll spreads much more extensively than mosaic and more at Lafayette than at Akron, due supposedly to the greater prevalence of the insect carriers.

[Plant disease studies in Tennessee] (*Tennessee Sta. Rpt. 1926, pp. 35–39, figs. 4.*)—Pear, apple, and quince material, in increasing quantity, is being tested for resistance to fire blight by J. A. McClintock. It has been definitely shown that the apple is practically immune to the root knot nematode. Sweet potato tests with standard or with new varieties, combined with careful roguing, have resulted in the selection of disease-free, high-yielding strains of the varieties Nancy Hall, Porto Rico, Southern Queen, Triumph, and Yellow Jersey. Bunch strains of Porto Rico and Yellow Jersey appear to have possibilities in Tennessee. Tests with certified Irish potato seed of different varieties have shown the superiority of these for commercial seed. Cabbage wilt-resistance tests have shown that Wisconsin Hollander and Wisconsin All Seasons can be depended upon, even under the most severe wilt conditions, to produce good marketable heads. Though not as early as the Wakefield varieties, the new resistant varieties retain their market qualities much longer than the Wakefield. Rust-resistant asparagus strains appear well adapted to Tennessee conditions.

Wheat deterioration studies reported by C. D. Sherbakoff dealt chiefly with head blight and root rot. Head blight resistant strains, eight in number, are regarded as a hopeful start toward larger wheat production. The study of root rot, though just begun, is seen to be a definite trouble, complex in character. Important wilt and blight diseases within the State include those affecting tomato, watermelon, cotton, cabbage, sweet potato, and corn. Crown gall of apple trees can be profitably controlled by increasing the soil acidity through the use of sulfur or of acid fertilizers. Tobacco wildfire and blackfire are being controlled practically by disease-free seed and sanitation.

Economic mycology, B. T. P. Barker (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 162–168*).—Observations on a number of the more important economic plant diseases are summarized.

Report of the mycologist for the year ended the 30th June, 1924, D. Rhind (*[Burma Dept. Agr.], Rpt. Mycol. 1924, pp. 6*).—Observations are reported as made on a rice stem and leaf sheath disease (*Sclerotium oryzae*), a disease of leaves and glumes (*Piricularia oryzae*), a disease resembling "straight head," from which an organism has been isolated, and grain abortion conditions, apparently associated with *Phoma* spp., *Epicoccum hyalopes*, *Fusarium* sp., and *Ustilaginoidea virens*; sesamum root disease (*Rhizoctonia solani*), supposedly soil borne, associated with the capsule-borne fungi *Cladosporium herbarum*, *Helminthosporium* sp., *Fusarium* spp., and *Phoma* sp., along with others; a peanut leaf disease (*Phyllosticta* sp.), a second leaf disease (*Cercospora* sp. (*C. personata?*)) resembling "tikka," and a stem disease due to a basidiomycete; sorghum purple rust (*Puccinia purpurea*), red leaf spot (*Colletotrichum graminicolum*), and grain smut (*Sphacelotheca sorghi*); cotton wilt (*Fusarium* sp.); wheat orange rust (*P. triticina*), stem rust (*P. graminis*), and smut (*Ustilago tritici*); sugar cane smut (*U. sacchari*) and other diseases (*Marasmius sacchari* and *Leptosphaeria sacchari*); mulberry leaf disease (*Phyllactinia corylea*) and rust (*Aecidium mori*); Hevea black thread, leaf fall, and root diseases (*Fomes lignosus* and *Ustulina zonata*); potato storage rot; coffee rust (*Hemileia vastatrix*), die back (*C. coffeanum*), and root disease (*Rosellinia* (?) sp.); and diseases of minor importance, including a berseem root disease (*Rhizoctonia* sp.) and pea rust (*Uromyces fabae*).

Report by the mycologist for the year 1924, J. G. C. Campbell (*Fiji Dept. Agr. Ann. Rpt. 1924, pp. 13, 14*).—This initial mycologist's report deals with bunchy-top, sigatoka, and other banana diseases; coconut thread blight, bleeding stem disease (*Thielaviopsis paradoxa*), leaf spot (*Pestalozzia pal-*

marum), smut (*Graphiola cocoina*), and bud rot (undetermined); pineapple fruit soft rot, sucker base rot, and leaf spot (all *T. paradoxa*); pawpaw fruit rot and tree death (*Phytophthora* sp. (*P. faberi* ?)); mango anthracnose (*Colletotrichum* sp.); tomato leaf spot (*Septoria lycopersici*), fruit black rot (*Macrosporium tomato* ?), and root knot (*Heterodera radicicola*); rubber canker (undetermined); melon anthracnose (*C. lanigerum*); Mauritius bean leaf spot (*Cercospora cruenta*); cacao pod black rot (*P. faberi*); citrus fruit (anthracnose die-back) scab (*Colletotrichum gloeosporioides*, *Cladosporium citri*) and rot (*Penicillium* sp. and *Phytophthora* sp.); coffee rust (*Hemileia vastatrix*); cotton leaf spot (*Mycosphaerella gossypina*); fan palm smut (*G. cocoina*); maize leaf stripe (*Helminthosporium* sp.); rice false smut (*Ustilaginoidea virens*); and strawberry leaf spot (*Mycosphaerella fragariae*).

Plant pathology in China (*Chinese Econ. Mo., 3 (1926), No. 9, pp. 375–380*).—Extracts here furnished from a report of the division of plant pathology of the College of Agriculture and Forestry of the University of Nanking attempt to give percentages of losses from diseases noted mostly near Nanking as affecting barley, broad beans, cabbage, corn, cotton, cowpeas, field peas, peaches, potatoes, soy beans, tomatoes, wheat, kaoliang, and millet. Information is briefly given as to the results of experimentation conducted in disease control in wheat, barley, broad beans, kaoliang, corn, cotton, and potatoes.

Crown gall [trans. title], E. F. SMITH (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 4, pp. 219–228*).—In this address, delivered in the French language before the Society of Plant Pathology and Agricultural Entomology of France, the author presented an account of his earlier studies on plant crown gall, with some results not previously published of his recent studies on that subject. The crown gall organism, *Bacterium tumefaciens*, is compared with *B. savastanoi* and *B. beticolum*, which produce effects somewhat analagous to those produced by *B. tumefaciens*.

Comparative studies on the physiology of Fusarium lini and Colletotrichum lini, Y. TOCHINAI (*Jour. Col. Agr., Hokkaido Imp. Univ., 14 (1925), No. 4, pp. 171–236, figs. 2*).—The author gives a systematic bibliographical and historical account of studies related to his own examination, which is chiefly herein reported, of the nutritive values of various carbohydrates and higher alcohols as carbon sources in the culture of *C. lini*, the cause of flax anthracnose, and of *F. lini*, the cause of flax wilt. Both of these fungi attack the flax plant most virulently at its seedling stage in Hokushu (Hokkaido). In the present paper the author dwells upon some physiological characters of the causal fungi and upon some phytopathological explanations, which are also detailed.

Overwintering of Gymnosporangium clavariaeforme [trans. title], L. MONTEMARTINI (*Riv. Patol. Veg., 15 (1925), No. 5–6, pp. 85, 86*).—The overwintering of *G. clavariaeforme* on *Crataegus oxyacantha* is discussed in comparison with that of other fungi.

The morphology and biology of Ovularia on Alchemilla [trans title], N. I. VASIL'EVSKIĬ (VASSILJEVSKIY) (*Bolezni Rastenii, 14 (1925), No. 1, pp. 18–28, fig. 1; Ger. abs., p. 28*).—On *Alchemilla* spp., it is stated, two species of Ovularia can be distinguished, one of these corresponding to *O. schröteri*, the other to *O. haplospora* and *O. alpina*. The ascus form, found on leaves of *A. cymatophylla* and *A. acutidens*, is described as a new form under the name *Mycosphaerella alchemillicola*.

The parasitism of Peronospora ficariae on Ranunculus ficaria [trans. title], N. A. NAUMOVA (*Bolezni Rastenii, 15 (1926), No. 2, pp. 92–99*).—The author investigated the morphology of *P. ficariae* on *R. ficaria* and the relations between fungus and host.

Variants in Ustilago nuda and certain host relationships, W. H. TISDALE and M. A. GRIFFITHS (*Jour. Agr. Research [U. S.], 34 (1927), No. 11, pp. 993–1000*).—Having followed up viewpoints and experimentation developed by Tisdale and others, as previously noted (E. S. R., 52, p. 648; 54, p. 47), and having employed in this work methods previously used (E. S. R., 54, p. 745), the authors were able to show from the data obtained that variants exist in *U. nuda*. These variants apparently correspond to what are termed in other fungi strains or physiologic forms. However, there is some indication that these variants are altered in their pathogenicity by certain hosts, and further study on these points is required. Various smut collections showed differences in their ability to produce smutted heads in barley varieties, and they affected germination and host development differently. In studying the loose smut of barley it is considered important that its effects on the host plant throughout its entire development be included. There may be strains of loose smut which infect barley in nature only through the floral organs, and this may be due to morphological or physiological characters of the host, to short-lived spores, or to other physiological characters of the fungus.

Some new tendencies in the study of the smut fungi (Ustilaginales) [trans. title], B. K. FLEROV (*Bolezni Rastenii, 15 (1926), No. 2, pp. 87–92*).—The author reviews recent studies on this group of fungi. He does not support the view that the spores formed in cultures are identical with those found in plants, since in the latter they are not formed by the fusion of gametes. He therefore designates as chlamydospores only those which form in culture. He points out that these fungi form biological races, and that they are also heterothallic. As to their phylogeny, on the basis of cytological data these fungi resemble rusts; on the other hand many differences exist.

Cereal rusts in the Paris region, 1923 and 1924 [trans. title], E. FOËX, GAUDINEAU, and [L.] GUYOT (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 3, pp. 196–204*).—Details are given as regards wheat varieties, *Puccinia* spp., and weather.

Cereal rusts in the southwest and southeast [of France] [trans. title], E. FOËX (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 3, pp. 205–211*).—An account of observations recorded as made, apparently in 1924, shows in general abatement of *Puccinia glumarum* with coincident increase of *P. triticina*. Varietal susceptibility to these fungi is discussed.

The physiology of germination of grain smut fungi [trans. title], I. V. NOVOPOKROVSKIĬ (NOWOPOKROWSKY) and F. D. SKAZKIN (T. SKASKIN) (*Bolezni Rastenii, 14 (1925), No. 2–3, pp. 82–100, figs. 3; Ger. abs., pp. 99, 100*).—Observations including 13 points are detailed for different cereals, also phases and physiology of the fungi causing diseases of these plants.

Dust treatments for the control of stinking smut of wheat, R. C. THOMAS, W. G. STOVER, and H. A. RUNNELS (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 115–117*).—Discrepancies observed for several years between results from wheat bunt control dust treatments at Wooster and those from similar treatments at Columbus led to the initiation of tests in the fall of 1925.

With the majority of the treatments used no very great differences appeared in the control obtained. The difference was outstanding in the case of the check plats, those at Wooster showing nearly three times as much smut as those at Columbus. It is thought that soil temperature was a significant factor in this difference, though the soil types described differ markedly.

Attention is particularly directed to the recognized standard dust treatments, comprising various forms of copper carbonate and copper sulfate. While copper stearate used at the rate of 1 oz. per bushel afforded better control of smut on the acid soil at Wooster than at Columbus, there is no sugges-

tion that this form of copper should be substituted for the carbonate. Considering the cost of the treatment and the degree of control obtained, none of the dusts showed marked superiority over copper carbonate. At Wooster the smut was reduced from 41 to less than 1 per cent, at Columbus from 14.6 to 2.3 per cent. It is considered evident that a dust carrying a high percentage of copper is not necessary, nearly as good control being effected with Sanders' dust, carrying only 8.5 per cent of copper, as with pure copper carbonate having more than 50 per cent copper. Both series of tests indicate that as good control of smut can be had from the use of 2 oz. of dust for each bushel of grain as from 3 oz., previously recommended. The degree of fineness of the dust, the humidity of the atmosphere at the time of treatment, and the method of treatment are considered to be factors bearing upon the amount of powder to be used.

Puccinia coronifera on winter rye [trans. title], L. RUSAKOV (RUSSAKOW) (*Bolezni Rastenii, 14 (1925), No. 1, pp. 7–11; Ger. abs., p. 11*).—A severe outbreak of *P. coronifera* on winter rye during the fall of 1924 in Voronezh (Kamennaja Steppe) was thought by the author to be connected with the particularly dry weather prevailing at that time.

Observations on brown-patch control in 1926, J. MONTEITH, JR. (*Bul. U. S. Golf Assoc. Green Sect., 6 (1926), No. 12, pp. 261–266*).—The present account is a summary of information for 1926 similar to that reported for 1925 (E. S. R., 57, p. 346), as communicated by persons who had experience during the year in control, chiefly with the different mercury compounds, of brown patch on putting greens. Both Semesan and Uspulun are said to have been again practically effective, with preference varying as between them. Bichloride of mercury appears to have been equally effective at Arlington, but likely to cause burning unless sufficient care is exercised to prevent its unequal distribution. Other factors may be significant in this connection.

Storage and transportational diseases of vegetables due to suboxidation, R. NELSON (*Michigan Sta. Tech. Bul. 81 (1926), pp. 38, pls. 8*).—The results are presented of the investigation of certain nonparasitic diseases arising in the storage or transportation of crucifers, lettuce, and potatoes. These diseases, which include black leaf speck of crucifers, red heart of lettuce and cabbage, and surface pitting of potato tubers, are claimed to be symptoms of breakdowns occurring under the present defective conditions of storage and transportation, caused primarily by an inadequacy of oxygen supply and by temperatures interfering with the utilization of the oxygen which may be present.

These breakdown diseases have been made to occur under controlled laboratory conditions of temperature and air composition, both of which are claimed to be important in such causation. Air movement without renewal does not prevent breakdown. At low temperatures air composition appears less important than cold.

Potato tuber surface breakdown occurs in the absence of black heart and may be produced by exposure to conditions less severe than those required for black heart.

It is suggested that "the ultimate cause of these diseases is the liberation or accumulation in certain cells of some toxic fragment resulting from the mixing of hydrolytic enzyme and glucoside. The conditions necessary for this reaction are brought about in storage and transportation by prolonged exposure to low temperature or an inadequate oxygen supply."

New lucerne disease reported in Australia (*New Zeal. Farmer, 47 (1926), No. 5, p. 352*).—A statement referring to the outbreak of the alfalfa nematode (*Tylenchus dipsaci*) disease recorded by Noble in the account previously noted (E. S. R., 57, p. 51) shows, besides an infection center in the Hunter

River district, the presence of the nematode on eight farms around Singleton, also its probable existence around Maitland and Raymond Terrace. The disease may have been present for as much as 18 years.

A helminthosporiose of Bengal grass (Panicum maximum) [trans. title], C. VAN OVEREEM (*Bul. Jard. Bot. Buitenzorg, 3. ser., 7 (1925), No. 4, pp. 431–434, fig. 1*).—Bengal grass, or Guinea grass (*P. maximum*), said to be one of the most important feed grasses in Java, is attacked seriously in pure culture by a Helminthosporium which is here descriptively treated as a new species, *H. panici*.

The leaf spot of celery (*Egypt Min. Agr., Mycol. Research Div. Leaflet 10 (1926), pp. 2, pls. 3*).—Celery leaf spot is discussed as to causal fungus (*Cercospora apii*), mode of infection, symptoms, and control by means of selection and Bordeaux mixture.

Celery rust and fungicidal sprays [trans. title], FLACHS (*Prakt. Bl. Pflanzenbau u. Schutz, 3 (1926), No. 12, pp. 287, 288*).—Celery rust (*Septoria appi*) sprayed with 2 per cent Bordeaux mixture and 2 per cent soda on August 7 and again 12 days later yielded sufficiently to warrant the hope of practical control of this disease by such means.

Factors influencing the severity of the crazy-top disorder of cotton, C. J. KING and H. F. LOOMIS (*U. S. Dept. Agr. Bul. 1484 (1927), pp. 22, pls. 6, figs. 5*).—A growth abnormality of cotton in the Salt River Valley of Arizona is said to have been observed in a few plants in 1918, over a small area in 1919, and in several new districts in 1922. Under the name acromania or crazy-top, the condition was compared by Cook in 1924 (E. S. R., 52, p. 348) with other cotton diseases of unknown causation or obscure origin. A survey in 1925 showed that the disease was present in both Pima Egyptian and upland cotton in all parts of the Salt River Valley, and that more than half the fields were more or less affected. It was also found in scattered areas in the Casa Grande Valley. Apparently it has not been found outside the counties of Maricopa and Pinal. Locally, however, it has already become economically important, and it is thought that it may soon develop very serious proportions.

Analogies or contrasts are indicated as regards certain diseases, and some conditions related to this abnormality are pointed out. Apparent soil and water relations are discussed. Hardness and dryness of soil may be factors, and root limitation and other abnormalities show some degree of positive correlation. The general tendency to shallow rooting in fields where crazy-top is prevalent is contrasted with the deep-rooting behavior of plants in alluvial soils where acromania has never appeared. The differences were evident even in single plants adjacent but standing in soils of widely contrasting conditions. In cases shown, this cotton disorder was absent or slightly prevalent in areas that had been cropped to alfalfa the year before, but more prevalent in areas continuously cropped to cotton for some years.

Pima makes more recovery than do upland varieties, but either may show return to normalcy. Apparently, increasing the water supply alleviates the conditions inducing crazy-top. The causal agent, if an organism, bears the relation of a weak virus or parasite having little or no effect on the plants under favorable growing conditions. The results of tests briefly indicated, though not conclusive as to the nature of the disease, give further support to the view that the disease, even if infectious, is not shown by the plants under favorable growing conditions.

Cotton crazy-top is readily responsive to control measures, chiefly cultural conditions. Rotation with alfalfa, which shows very striking contrasts, is definitely indicated as a practical measure. A regular rotation system with alfalfa is in itself a corrective method for obtaining better penetration and

storage of water, which may also be improved by attention to direction of water flow and by conservation devices.

Fungoid diseases of cotton in Southern Nigeria, T. LAYCOCK (*Nigeria Agr. Dept. Ann. Bul., 5 (1926), pp. 17-23*).—Diseases of cotton, with some causal fungi, are discussed. American cotton shows considerable resistance to fungus diseases except in cases associated with insect injury to bolls. Of injurious insect-borne fungi affecting bolls of both American and native cotton, Nematospora (?) is said to be by far the most important. Bacterial disease due to *Pseudomonas malvacearum*, which is invariably followed by *Fusarium* sp., may injure native cottons in wet seasons. Anthracnose boll rot fluctuates in ways which are not fully understood. Insect pests supposedly introduce boll rots due to as many as six different fungi.

Notes on the fungus Rhizopus nigricans Ehr. in relation to insect pests of the cotton plant in Egypt, T. W. KIRKPATRICK (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 54 (1925), pp. 28, pl. 1, figs. 3*).—*R. nigricans* is in Egypt a wound parasite of cotton bolls, which it enters through punctures made by either of the pests *Nezara viridula*, *Creontiades pallidus*, *Earias insulana*, or *Gelechia gossypiella*. Details are given.

The influence of smut on the development of millet [trans. title], A. N. BUKHGEĬM (BUCHHEIM) and M. N. SHMANEV (SCHMANEW) (*Bolezni Rastenii, 15 (1926), No. 1, pp. 42-46; Ger. abs., p. 46*).—Differences noted in proportions and total results of development in different parts of sound and smutted millet are outlined.

The downy mildew of onions (Peronospora schleideni), with particular reference to the hibernation of the parasite, P. A. MURPHY and R. M'KAY (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 22, pp. 237-261, pls. 4, figs. 2*).—The observation, reported in 1921 (E. S. R., 46, p. 847), that mycelium of the onion false mildew fungus (*P. schleideni*) could overwinter in scaly leaves of onion bulbs has since been verified, and the present paper deals more fully with the work as carried on during the previous five years.

Record is made of the occurrence in the bulbs of onions (*Allium cepa*), potato onions (*A. cepa multiplicans*), shallots (*A. ascalonicum*), and Egyptian onions (*A. cepa bulbelliferum*) of a perennial mycelium, which has proved to be that of *P. schleideni* and which was subsequently found to permeate the green shoots produced from these bulbs. The effect of the disease on the bulbs and shoots and the subsequent production of mildew are described. Onions were infected with mildew through the leaves, the mycelium spreading into the bulbs. Inoculation succeeded only when made through the leaves. Resting spores occurred very rarely in Ireland in the leaves of the mildewed plants. Soil infection is practically nonexistent. Perennial mycelium is extremely common in Ireland and is believed to originate most of the disease. Evidence is presented regarding its probable occurrence elsewhere.

Onions raised from seed sown in autumn overwintered the mycelium of the fungus and produced mildew in early spring. Onion sets, potato onions, shallots, onions grown for seed, Egyptian onions, and possibly other species of Allium are also capable of overwintering the fungus in their bulbs. The infection of onions raised from seed in the spring from such systematically infected plants has been followed, and no evidence of the infection of the seed was secured. Notes are given on degrees of resistance of foliage and bulbs in onion varieties. The mycelium was destroyed by heating infected onion bulbs in air at 40° C. (104° F.) for eight hours. Attempts to grow the mildew fungus on artificial media were unsuccessful.

White rot disease of onions: Immunity trials, R. M. NATTRASS (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925-26), pp. 177, 178*).—

Owing to the exceptionally dry season, only the very susceptible varieties were attacked by *Sclerotium cepivorum*. Varieties apparently immune included Magnum Bonum, Selected Coconut, and Selected Red.

Verticilliose of pepper in Italy [trans. title], M. CURZI (*Riv. Patol. Veg.*, *15 (1925), No. 9–10, pp. 145–160, figs. 3*).—In the Marches, in the Abruzzo, and in Lombardy, *Capsicum annum* is subject to a disease, the symptoms and consequences of which are described in connection with *Verticillium tracheiphilum*.

Methods for investigating the virus diseases of the potato, and some results obtained by their use, P. A. MURPHY and R. M'KAY (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1926), No. 14, pp. 169–184, pls. 2*).—This account of experimental methods for potato virus disease studies includes some of the results obtained. A reliable method is described for grafting tubers. Diseases of the mosaic group are transmitted by this means, and the regularity with which this occurs is supposedly in direct proportion to the infectiousness of each disease. The diseases are sometimes separated from each other in this process. Leaf roll is transmitted rarely, and its entire suppression can apparently be brought about by incubating the grafted tubers at 20° C. (68° F.). The method of grafting employed is adapted to experiments designed to run for one season only, the tubers being planted in the open. Other applications are discussed.

Other means of infecting tubers are mentioned. The use of aphides has not been found sufficiently reliable for routine work, although *Myzus persicae*, *M. pseudosolani*, and *Macrosiphum solanifolii* were shown to carry infection. For infecting stalks and foliage, cleft grafts are reliable (except for streak occasionally) and transmit all diseases and combinations equally. Leaf mutilation also transmits streak. Aphides are unreliable at least for leaf roll, which was again found to be transmitted by *Calocoris bipunctatus*.

A method is described whereby the rate of spread of a virus in the potato plant may be studied more exactly. Leaf-roll virus reached all points of the stem and tubers from a scion grafted on at the top after an interval of more than 8 to 10 days and less than 14 to 15 days.

The occurrence of varieties tolerant to streak has been proved, and methods are suggested for securing other varieties free from this disease and for proving the presence of streak in tolerant varieties.

Potato varietal resistance to bacterial diseases [trans. title], V. P. IZRAIL'SKIĬ [W. ISRAILSKY] and E. V. RUNOV [RUNOW] (*Bolezni Rastenii, 14 (1925), No. 1, pp. 1–7; Ger. abs., pp. 6, 7*).—The resistance of potato varieties to *Bacterium fluorescens*, *B. xanthochlorum*, and "Bacterium No. 1" was studied. Use was made of 1 per cent bromine to disinfect the tuber sections to be tested for resistance. Snitsch, Switjes, and Grazia potatoes showed the highest resistance to infection. Biochemically, the three forms of bacteria are closely related. Treatment of the soil with 25 mg. $CaCl_2O$ per 100 gm. of soil rendered the bacteria harmless.

Potato degeneration and maturity of the seed tubers [trans. title], V. DUCOMET (*Rev. Path. Vég. et Ent. Agr., 11 (1924), No. 3, pp. 183–188*).—In a contribution which is historical, like one previously noted (E. S. R., 55, p. 752), the auther agrees with conclusions attributed to Botjes (but not cited) to the effect that probably the superiority for seed purposes of unripe tubers is correlated with their state as regards pathology rather than their condition as regards physiology. Degenerating diseases are contagious. The infection occurs during growth, and the occurrence (frequency) of contamination should vary somewhat, according to the length of the period of exposure to the infective agent. Hence, immature seed tubers should show a certain degree of freedom from degeneration in the progeny.

A new treatment for potato diseases [trans. title], EBERHARDT and J. CHEVALIER (*Rev. Hort. Algérie, 30 (1926), No. 9, pp. 200–202*).—The comprehensive idea of controlling degenerating potato diseases which are carried by insects, and at the same time of protecting the plants against other disease, particularly those caused by fungi, was tested upon several potato varieties named as affected with mosaic, frisolée, and leaf roll, along with fungus diseases, by employing a preparation obtained by treatment of a hydrocarbon (of the series $C_n H_{2n-2}$ and polymers) in the presence of sulfur so as to separate sulfureted hydrogen.

The preparations are said to be effective against both the insect carriers of degenerating diseases and such disease fungi as *Sphaerotheca pannosa* and *Phytophthora infestans*. They appear to check the development of potato degenerating diseases and to give an acceleration of development and a greater degree of vitality in the vegetative phases, which phases are also prolonged with definite increase of yield.

Effect of leaf-roll disease in potatoes on the composition of the tuber and "mother tuber," W. McLEAN (*Jour. Agr. Sci. [England], 16 (1926), No. 2, pp. 318–324, fig. 1*).—It was found that tubers from secondary leaf roll plants have a lower dry matter content than tubers from healthy plants. The nitrogen in the dry matter is also appreciably higher. The difference in dry matter content is sufficiently large in many varieties to characterize leaf roll tubers. Nutrient materials are removed by the young plants from leaf roll mother tubers much more slowly than in case of plants from healthy mother tubers. It is thought that determination of dry matter in the mother tuber two or three months after planting would serve as a further character in the diagnosis of secondary leaf roll.

Susceptibility of German potato varieties to Phytophthora infestans [trans. title], O. VOWINCKEL (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1926), No. 4, pp. 588–641*).—A study of German potato varieties as to their susceptibility to late blight (*P. infestans*), with a review of research methods, presents in tabular form, with discussion, the various data as regards temperature, air humidity, light intensity, nutritive condition, and vegetative stage of the host plant. Fructification and vegetative (mycelial) growth showed, respectively, ranges of 8.7 to 26° and 4.6 to 27° C. Apparently, 100 per cent is the optimal relative humidity of the air for sporangia formation. Nutritive favoring conditions are outlined. No influence of light intensity on growth of Phytophthora was observed. Older leaves were generally more susceptible than younger. The effects of attempted inoculation with *P. infestans* on wild and cultivated Solanaceae are detailed.

Control of Hypochnus solani (Rhizoctonia solani) by fungicidal treatments [trans. title], H. BRAUN (*Arb. Biol. Reichsanst. Land u. Forstw., 14 (1926), No. 4, pp. 411–454, pls. 2*).—This deals in systematic form with aspects and relations of the whole problem of fungicidal control as applied to *H. solani* (*R. solani*).

[**Bacterial blight of soy bean**], G. K. BURGVITS (BURGWITZ) (*Bolezni Rastenii, 14 (1925), No. 1, pp. 38–41; Ger. abs., pp. 40, 41*).—After a brief review of soy bean bacterial blight or pustule, known in North America and in the Orient, the author gives an account, with discussion, of the occurrence of a similar disorder of soy bean from Urga, Mongolia.

Pocket atlas of sugar beet diseases, O. APPEL (*Taschenatlas der Krankheiten der Zuckerrübe. Berlin: Paul Parey, 1926, pp. [44], pls. 20*).—This booklet, approximately uniform in size, style, and treatment with the two relating to potato diseases previously noted (E. S. R., 56, p. 50), includes a few beet disorders due directly to animal pests.

Some serious sugar-cane diseases not known to occur in Cuba, J. A. Faris (*Trop. Plant Research Found. [Wash., D. C.] Bul. 4 (1926), pp. 22, figs. 10*).—A brief review of the cane-disease situation in Cuba, as compared with that in some other regions, leads to the conclusion that Cuba is probably free from sereh, Fiji disease, downy mildew, gummosis, leaf scald, dry top rot, sugar cane smut, and rust. These diseases are discussed as to symptoms, causation, and control.

Sugar cane posts and diseases, W. Cottrell-Dormer (*Aust. Sugar Jour., 17 (1926), No. 10, pp. 630–632*).—An inspection report by the author deals briefly, as regards Tully River areas, with sugar cane leaf scald affecting Badila cane; also a disease first observed at St. Helens and now named brown rot. As regards the Herbert River district, gumming disease is less injurious since the very susceptible variety, Clark Seedling, has been discarded. Other diseases referred to are top rot, red rot, and foot rot.

Investigations into diseases of cane, H. T. Easterby (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt. 26 (1926), pp. 26–29*).—This section of the director's report includes an account of cane-disease investigations, briefly as carried on by W. Cottrell-Dormer, but chiefly as carried on since March, 1926, and as reported, by his successor, N. L. Kelly.

A summary of observations in various localities is given regarding Fiji disease, gumming disease (*Bacterium vascularum*), leaf scald (*Bacterium* sp.), leaf stripe (*Sclerospora sacchari*), mosaic (undertemined), a top rot (seasonal ?), a leaf sheath sclerotial disease, red rot (*Colletotrichum falcatum*), foot rot (a root fungus), and iliau (a fungus disease of young shoots).

Relationship of cane varieties to diseases, M. T. Cook (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 4, pp. 277–281*).—In a discussion of cane varieties as related to diseases, the author deals briefly with the history of the more important cane diseases, mosaic, vascular disease or dry top rot (*Plasmodiophora vascularum*), Manatí disease (eye spot), and gummosis, as illustrating the importance of the selection of resistant varieties in the growing of sugar cane.

Mosaic disease in Jamaica (*Sugar [New York], 28 (1926), No. 1, p. 30*).—Information taken from a circular issued by the Jamaica Department of Agriculture shows that sugar cane mosaic, introduced some years ago, has spread to all parts of Jamaica, probably being present now in almost every cane field in the island. Uba is the only immune cane variety. Maize, and a number of wild grasses, though perhaps themselves not affected seriously, harbor the disease, which is carried by insects to the cane.

[Sugar cane mosaic and the sugar industry in the Philippines], S. Asuncion (*Philippine Agr. Rev., 18 (1925), No. 1, pp. 33–38, fig. 1; also in Sugar [New York], 28 (1926), No. 2, pp. 79, 80*).—Sugar cane mosaic, known to have existed, in some cases as long as 15 to 20 years, in Argentina, Cuba, Hawaii, Fiji, Australia, New Guinea, Egypt, Java, Porto Rico, and the southern United States, is said to have become prevalent in most of the sugar cane growing regions in the Philippines since its first reported observation, supposed to have occurred about 1910 or 1911. This situation is ascribed to lack of care in the selection of planting material, to continuous ratooning, and to poor cultivation. These accounts show the actual losses caused by cane mosaic in case of Negros Purple, the standard variety of cane in Negros. Local distribution, ways of spreading, and effects on plant and product are detailed.

The average cane yield tonnage reduction by mosaic is said to be 61.28 per cent, though stooling is not affected. The sugar yield is reduced by 70.63 per cent. Data obtained show that 98 per cent of the young plants inherit the disease. In the area planted with healthy points only 4 per cent showed

mosaic. One method, believed to be practical, of reducing losses is the selection of points from healthy plants exclusively.

Mottle-necrosis of sweet potatoes, L. L. HARTER (*Phytopathology, 15 (1925), No. 1, p. 45*).—Since the publication of the article previously noted (E. S. R., 54, p. 49), sweet potato mottle necrosis has been located in new regions, indicating its probable spread. By use of a special technique the author has been able to isolate a Pythium from the dead tissue in almost every case. In view of this and of the results from some preliminary inoculations in the laboratory, it is believed that *Pythium* sp. is probably the causal organism.

Mottle necrosis of sweet potatoes, L. L. HARTER and W. A. WHITNEY (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, pp. 893–914, figs. 6*).—Detailed studies reported in the present article show that the sweet potato mottle necrosis referred to above may be produced by any of several species of Pythium, readily by *P. ultimum*, *P. scleroteichum*, and *P. aphanidermatum*, less readily by *P. splendens*. As *P. ultimum* and *P. scleroteichum* are found in rootlets in the hotbed, it is concluded that rootlet rot and mottle necrosis are produced by the same organisms. All varieties tried were infected artificially. Triumph, Yellow Jersey, and Big Stem Jersey are very susceptible, but a number of good commercial varieties appear to be more or less resistant. Temperature largely determined the type of decay, which is apt to be marbled if above 20° C., cheesy if below that reading. The specific maximum, minimum, and optimum temperatures are given. In case of *P. ultimum*, as an example, though the optimum for growth in pure culture is about 32° C., the greatest amount of sweet potato decay occurs between 12 and 15°. Mottle necrosis is not a storage trouble. Comparison is made between the decay due to *Rhizoctonia solani* and that due to Pythium.

Crop rotation should be practiced where control measures are required. New soil should be used each year in the hotbed.

The comparative susceptibility of sweet-potato varieties to stem rot, L. L. HARTER and W. A. WHITNEY (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, pp. 915–919, fig. 1*).—Studies previously noted (E. S. R., 34, p. 444) having shown that sweet potatoes could be infected artificially with stem end rot, also that natural infection of a few varieties occurred when these were planted on infested soil, it was planned to test susceptibility under field conditions, using, where practicable, only naturally infested soil. The procedure is outlined as used on infested soil during 1922–1925 at Houston, Del., and during 1925–1926 at Seaford, Del., in testing the relative susceptibility of 21 varieties to *Fusarium batatatis* and *F. hyperoxysporum*. At Houston the soil infestation and the infection probability were increased by dipping the roots in a spore suspension of the stem rot organisms just before planting. It was found that the two varieties which were very susceptible at Seaford were also very susceptible at Houston.

Apparently there are no varieties entirely immune to stem rot, though the injury to such varieties as Creola, Dahomey, Haiti, Key West, Pierson, Pumpkin, Red Brazil, Southern Queen, Triumph, White Yam, and Yellow Strasburg is so slight that a normal crop can be produced by them even when grown on badly infested soil. Varieties very susceptible include Yellow Jersey, Red Jersey, Porto Rico, Nancy Hall, Gold Skin, Georgia, and Big Stem Jersey, a large percentage of infected plants of these varieties being killed during the growing season.

Phytophthora infestans on tomato [trans. title], V. N. BONDARTSEVA-MONTEVERDE (BONDARZEVA-MONTEVERDE) (*Bolezni Rastenii, 15 (1926), No. 1, pp. 1–27; Ger. abs., pp. 26, 27*).—In and near Leningrad, tomato fruits are very severely and foliage is less severely or not at all attacked by a Phytophthora

which, on the basis of morphology and cultural characters, is regarded as *P. infestans*. The results are given of inspection and infection tests as regards the reaction of this fungus to other Solanaceae. Copper-lime sprays are effective.

Control of tomato blights, F. J. PRITCHARD (*Canning Trade, 49 [i. e., 50] (1927), Nos. 22, pp. 50, 52, 54, 56, 60, 62, figs. 9; 23, pp. 18, 20, 22, figs. 6*).—This account is limited to tomato Septoria leaf spot and early blight, said to be the most common and, with the exception of wilt in some localities, the most destructive of tomato diseases in the Middle East and Middle West. Control measures relied upon include seed treatment (with mercuric chloride at 1:3,000), clean seed beds, use of early plants, crop rotation, spraying (Bordeaux mixture at 4–4–50, with 2 lbs. of rosin fish oil soap, at 50 to 100 gal. per acre), fall plowing, clean culture, and resistant varieties.

The results of fall plowing, as exemplified at the Arlington Experimental Farm, are considered to show that tomatoes should be planted on thoroughly fall-plowed land in the Middle East and Middle West, where Septoria leaf spot and early blight are commonly destructive.

Some fungus diseases of fruit trees (*[Irish Free State] Dept. Lands and Agr. Leaflet 84 (1926), pp. 12, pls. 2*).—The fruit-tree diseases here discussed include pear scab (*Venturia pyrina*); apple scab (*V. inaequalis*), canker (*Nectria galligena*), mildew (*Podosphaera leucotricha*), brown rot (*Sclerotinia (Monilia) fructigena*), and blossom wilt (*S. (Monilia) cinerea mali*); plum and cherry blossom wilt, wither tip, and brown rot (*S. (Monilia) cinerea pruni*); and plum silver leaf (*Stereum purpureum*), the causal organism attacking also, among other trees and shrubs, apple, peach, nectarine, Morello cherry, almond, apricot, Portuguese laurel, laburnum, rhododendron, currant, and gooseberry. Varietal susceptibilities are indicated.

Fungous diseases of fruit-trees in New Zealand and their remedial treatment, G. H. CUNNINGHAM (*Auckland: New Zeal. Fruitgrowers' Fed., 1925, pp. XXXI+382, figs. 177*).—This publication, based on a 5-year study in field and laboratory of the fungus diseases attacking the commercial orchards in New Zealand, is in two sections, the first dealing with general matters relating to hosts, fungi, bacteria, and control measures and the second dealing with specific organisms causing various orchard diseases. The chemistry of sprays is dealt with in as elementary a manner as is thought practicable. Fruits and diseases are systematically considered. The bibliography comprises 337 titles.

Fungi causing fruit rots [trans. title], H. FAES and M. STAEHELIN (*Ann. Agr. Suisse, 26 (1925), No. 1, pp. 59–72; abs. in Rev. Bot. Appl. et Agr. Colon., 5 (1925), No. 52, pp. 959–961*).—Particulars are given regarding the action of salts studied, including principally those of copper, nickel, zinc, and iron, on spores of the fruit-parasitic fungi *Penicillium glaucum*, *Botrytis cinerea*, and *Monilia fructigena*.

On the diseases known as "bark canker" and "die back" in fruit trees, H. R. BRITON-JONES (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 224–243, pls. 2*).—A general account, with a bibliography of 24 titles, deals in some detail with fruit tree diseases due to *Myxosporium corticolum*, *Diaporthe perniciosa*, and *Cytospora* spp.

The perfect form of Sphaeropsis [trans. title], G. ARNAUD (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend., 48 (1924), pp. 444–446, figs. 2*).—The synonymy of *Sphaeropsis* spp., which attack various fruit trees, is obscure. The author claims that a perfect form of *S. pseudo-diplodia* has been found on bark of *Pyrus malus*. A description of this is given as a new species with the name *Didymella mali*.

Apple tree canker and Sphaeropsis malorum [trans. title], G. PRETI (*Ann. R. Ist. Super. Agr. Portici, 3. ser., 1 (1926), pp. 25-41, figs. 5*).—A study of the organism associated with apple tree canker presents in conclusion the synonymy of *S. malorum*.

Studies on the apple rust caused by Gymnosporangium yamadae, T. FUKUSHI (*Jour. Col. Agr., Hokkaido Imp. Univ., 15 (1925), No. 5, pp. 269-307, pls. 4*).—In the present paper are presented the morphology of the apple rust fungus (*G. yamadae*), the anatomical features of the gall induced by the fungus on *Juniperus chinensis* and *J. sargenti*, and the results of inoculation experiments on 50 apple varieties.

Bitter pit in apples: A review of the problem, A. J. M. SMITH ([*Gt. Brit.*] *Dept. Sci. and Indus. Research, Food Invest. Spec. Rpt. 28 (1926), pp. IV+24, pls. 2, figs. 4*).—This special bitter pit report deals with characteristics, orchard factors, theories, development in storage and on the tree, storage temperature, maturity at picking, and commercial aspects of the bitter pit problem.

To a presentation and critical discussion of present knowledge is added some information not published hitherto. The question is not yet settled whether the disease may develop from a start made after storing. The fact that severe pruning and heavy late irrigation predisposed to bitter pit suggested a connection between this disease and the water relations of the growing fruit.

In certain varieties the trouble appears while the fruit is still on the tree. In other varieties it seems to be inhibited while on the tree, developing rapidly after picking, particularly in fruit picked while relatively immature. Cold storage retards bitter pit in some susceptible varieties, but the retarding effect of cold storage, where present, is lessened by delay in storing. It is suggested that, pending conclusive experimental work, a combination of later picking with more rapid refrigeration may be advantageous.

Cause of the peach drop in 1924, R. C. WALTON (*Penn. State Hort. Assoc. Proc., 66 (1925), pp. 71-75*).—An account is given of abnormal peach drop during July, 1924, in an orchard in Adams County, Pa. A description is given of the cankers, with views as to causation and an account of reports from other areas. No organism was isolated in the Pennsylvania area.

Present status of peach yellows in Pennsylvania, W. A. MCCUBBIN (*Penn. State Hort. Assoc. Proc., 66 (1925), pp. 75-78*).—This detailed and tabulated account indicates a decrease in the amount of peach yellows and little peach during the season of 1924. Apparently peach yellows was not spread in any marked degree by use of any particular nursery stock.

A comparison of dusts and spray to control fungous diseases of the cranberry, B. F. DRIGGERS (*New Jersey Stas. Bul. 450 (1927), pp. 16*).—Giving the results to date of experimentation beginning in 1923 to compare some of the more promising dusts with liquid Bordeaux, and a summary to date also of investigations by others dealing with the use of liquid Bordeaux on cranberries, the author states that a Bordeaux-soap spray coating maintained on the fruit and foliage of a badly infested cranberry bog throughout the growing season of the berries decreased rot and increased yield. Copper lime dust did not stick as well, nor was it as effective. Of the different combinations used of monohydrate copper sulfate and hydrated lime, the 50-50 formula gave the best control. On a badly infested bog, rot fungi were not satisfactorily controlled with one season's use of dry ground Bordeaux, colloidal sulfur, or 25-75 copper lime dust, though the ground Bordeaux appeared to be the most promising.

In six years of spraying with Bordeaux-soap on a bog recovering from cranberry girdler injury, good control of rot fungi was obtained after the second year. The effects of this treatment are said to be cumulative. Plats sprayed for five years and then left unsprayed the following year produced a sound

crop of berries. One season's results from a comparison of copper carbonate and colloidal sulfur with Bordeaux-soap spray indicate that these two dusts are not suitable as a control for cranberry rot fungi. On two bogs colloidal sulfur as a dust fungicide burned both fruit and foliage.

Phomopsis cinerescens on fig [trans. title], L. Maffei (*Riv. Patol. Veg., 15 (1925), No. 3-4, pp. 37-47, figs. 6*).—An account is given of the parasitism by *P. cinerescens* on fig branches.

Spraying for the control of fig rust, W. B. Lanham, R. H. Wyche, and R. H. Stansel (*Texas Sta. Circ. 47 (1927), pp. 8, figs. 3*).—The crop of the Magnolia fig, which is the only variety grown for market in Texas, is considerably impaired every year by rust (*Uredo fici*). This causes a leaf drop, and it may make the fruit difficult to peel with lye; but supposedly the greatest damage is due to sunburn occurring after the rusted leaves fall. The life history of the fungus and control measures have not yet been adequately worked out. A brief review of the related literature is given.

In March, 1924, orchards of Magnolia figs were planted at Angleton on Victoria clay and at Beaumont on a dark phase of Crowley clay, and in 1924–1925 preliminary protection work was started with Bordeaux mixture.

Conditions and results, as tabulated, show practically no difference between Bordeaux mixture rust control at 5–5–50 and that at 10–10–50. Bordeaux as a dormant spray gave no rust control, but when applied to the leaves it protected them throughout the season, with little difference in effectiveness for intervals of 15, 30, or 45 days. The trees should be sprayed with Bordeaux 5–5–50 when the disease appears, usually about July 15, and subsequently often enough to protect new fruit and leaves, usually about every 30 days until September 15 or later.

Experiments on the control of American gooseberry mildew, R. M. Nattrass (*Jour. Bath and West and South. Counties Soc., 5. ser., 20 (1925–26), pp. 172–176*).—American gooseberry mildew has become a serious menace to gooseberry culture in the Bristol Province, and control experiments are being carried on. The 1925 results are outlined for ammonium polysulfide and soft soap, a proprietary soda-sulfur compound and soft soap washing soda and soft soap, and Burgundy mixture. All applications except the Burgundy mixture gave good results from the small-scale tests carried out, though the relative values of the results of the three successful sprays have not been determined.

Virus diseases of raspberries, C. W. Bennett (*Michigan Sta. Tech. Bul. 80 (1927), pp. 38, pls. 11*).—Sketching the history of raspberry virus diseases in the United States and Canada and detailing experimental work, the author states that there appear to be five distinct virus diseases of raspberry, corresponding to the names curl, red raspberry mosaic, mild mosaic, yellow mosaic, and streak. Except streak, all these have been transmitted by aphids, of which the species *Aphis rubiphila* and *Amphorophora rubi* have been used for this purpose in experimentation. Inoculation experiments indicate that *A. rubi* distributes the mosaic, and that *Aphis rubiphila* chiefly disseminates curl.

While one aphid may inoculate a plant, more aphids give a larger percentage of infection. *A. rubiphila* transmits curl for at least 48 hours after contact with virus plants. Evidence has been obtained to the effect that individuals may carry curl virus for more than three weeks. Apparently the egg stage does not transmit the virus. Temperature has a very decided influence in masking symptoms of mild mosaic and of red raspberry mosaic. Curl symptoms are marked at all temperatures at which affected plants will grow. Symptoms of red raspberry mosaic range widely with varieties. Girdling experiments indicate that the virus moves in some part of the bark, presumably the sieve

tubes. The movement of curl virus within a plant is relatively slow, and is supposedly connected with food translocation. Within the raspberry group are to be found wide varietal ranges of behavior as regards disease tolerance, susceptibility, and apparent immunity.

The most satisfactory control measures available for general use are careful and efficient roguing and the selection and increase of virus-free raspberry nursery stock.

Observations on citrus wilt, A. S. RHOADS (*Fla. State Hort. Soc. Proc., 38 (1925), pp. 26–39*).—Preferring, as more distinctively descriptive, the term "wilt" to either of the common terms "blight" or "leaf curl" as applied to this trouble, which has been known in Florida for about 50 years, the author gives an account that is historical and descriptive. The trouble is considered physiological, probably due primarily to irregularities of soil-moisture conditions, chiefly a deficiency in soil moisture available during the dry season. Prevention will require use of the more desirable types of soil only and their proper maintenance. Wind burning, so-called, is a dehydration of the leaves and twigs brought about by a too rapid evaporation rate. Irrigation would be of decided value. Reproduction of the original natural habitat, so far as practicable, is considered desirable.

The borax treatment of citrus fruit for prevention of decay, H. R. FULTON (*Fla. State Hort. Soc. Proc., 38 (1925), pp. 117–123*).—The borax treatments for blue mold rot or stem end rot, which together are said to cause practically all of the decay of Florida citrus fruit after leaving the tree, include the cold treatment (not below about 70° F.), which prevents over 50 per cent of blue mold decay and almost 75 per cent of stem end rot over a two or three weeks marketing period, and the heat treatment (115–120°), which increases its effectiveness to more than 90 per cent for blue mold rot and to about 80 per cent for both forms of stem end rot. A concentration of 5 per cent is protective in a marked degree; solutions up to 10 per cent are only slightly more so, and they leave a too conspicuous sediment. Installation and procedure are discussed.

A new disease of Acacia baileyana [trans. title], A. AGOSTINI (*Riv. Patol. Veg., 15 (1925), No. 5–6, pp. 113–122, fig. 1*).—A new leaf spotting fungus of *A. baileyana* is said to be a new species and named *Phyllosticta pollaccii*.

Die-back in Hevea caused by a bug [trans. title], W. BALLY (*Meded. Proefsta. Malang, No. 49 (1924), pp. 10, pls. 6; Eng. abs., p. 10*).—On an isolated estate near Melang, Hevea trees showed signs of die-back, infected branches bearing finally brown depressions and the apical portions becoming withered and split. Often, side shoots arose from dormant buds. A bug, *Dindymus ribiginosus*, was often seen sucking at the spots where the infection usually started. Attempted infection tests with these bugs on trees growing in the experimental garden (hence under more favorable growing conditions) were not followed by the typical symptoms.

Pests and diseases of mahogany (Swietenia mahagoni and S. macrophylla) cultivated in Java [trans. title], L. G. E. KALSHOVEN (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Inst. Plantenziekten, 69 (1926), pp. IV+126, pls. 22; Eng. abs., pp. 107–126*).—The purpose of this publication is to present all information available to date regarding injuries of mahogany due to climatological factors, soil conditions, other unfavorable factors locally, fungus diseases, noxious plants, insects, men, game, birds, and miscellaneous agents.

Cobweb disease of mahogany and teak [trans. title], M. B. SCHWARZ (*Dept. Landb., Nijv. en handel [Dutch East Indies], Korte Meded. Inst. Plantenziekten, No. 2 (1926), pp. 9, pls. 4; Eng. abs., pp. 7–9*).—A cobweb fungus is

described as spreading over and into branches, leaf stalks, and leaves of both mahogany (*Swietenia mahagoni*) and teak (*Tectona grandis*). Comparison is made with cobweb fungi found on different plants and designated as thread blights by Petch in his own accounts, some of which have been noted (E. S. R., 53, p. 49; 54, p. 449). For blights of this character the present author prefers the name cobweb disease, as an accurate translation of the descriptive Dutch name spinnewebziekte. This organism appears to belong to the so-called Marasmioid group of thread blights.

White pine blister rust, W. A. McCubbin (*Penn. Dept. Agr. Bul. 426 (1926), pp. 25, figs. 15*).—A summary of information on this disease.

A correctional note on the naming of Cytosporina septospora [trans. title], G. Dorogin (*Bolezni Rastenii, 15 (1926), No. 1, pp. 48–50, fig. 1*).—The author found needles of *Pinus silvestris*, *P. montana*, *P. laricio*, and *P. sabiniana* to be infected with a fungus, the morphological characters and physiological behavior of which show it to be *Brunchorstia pinea*. This form was described earlier by the author (E. S. R., 26, p. 852) as *C. septospora*, which naming is now said to be erroneous.

The more important diseases and pests of ornamental plants under glass or in the open, R. Laubert (*Die Wichtigsten Krankheiten und Schädlinge der Zierpflanzen im Gewächshaus und Freien. Berlin: Paul Parey, 1924, pp. 130, figs. 83*).—Of the two sections of this book, dealing with diseases and pests of ornamentals, the first takes up the plants in the alphabetical order of the names. The second deals rather with injurious agents as characteristically affecting parts or regions of the plant.

A new disease of Cobaea scandens [trans. title], A. Nannizzi (*Riv. Patol. Veg., 15 (1925), No. 1–2, pp. 1–4*).—In the Botanical Garden of Siena *C. scandens* is attacked by a leaf spotting fungus which is diagnosed as a new species, *Septoria oligocarpa*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The practical value of birds, J. Henderson (*New York: Macmillan Co., 1927, pp. XII+342*).—In this work the author analyzes and digests the more important data on economic ornithology in North America. Part 1 (pp. 3–112) is a general discussion of the subject, dealing with the function of birds in nature, their relation to farm crops, orchards, forests, and poultry yards, and their work as scavengers and in the control of injurious insects, mammals, and weeds; the quantities and kinds of food they require; their status as possible carriers of disease and parasites, etc. Part 2 (pp. 115–290) takes up the orders, families, and species of birds in systematic order and discusses in detail their food habits, as shown by direct observation and by examination of the stomach contents. Much of the data is presented in tabular form. Bibliographical references are given as footnotes, and a general bibliography of 28 pages is included.

Partridges: Yesterday and to-day, E. Parker (*London: Field Press Ltd., 1927, pp. XIII+15–111*).—This is an analysis of the replies to a questionnaire sent out in the fall of 1926 to owners of partridge manors in England, Scotland, and Wales. The chapters deal with the changed conditions of farming, some questions of food supply, the Euston system, importation of Hungarian partridges and the exchange of eggs, winter feeding, diseases old and new, records of bags, and counsel from experience.

[Report of the department of entomology of the Indiana Station] (*Indiana Sta. Rpt. 1926, pp. 27–29, fig. 1*).—In referring to insects in their relation to plant diseases, extensive experiments have shown conclusively that the

spinach aphid (*Myzus persicae*) is the principal agent in disseminating potato leaf roll under Indiana conditions, and that the potato leafhopper (*Empoasca fabae*) is also capable of transmitting the disease but to a lesser degree. It is pointed out that the spinach aphid has also been discovered to be the principal insect factor in the carriage and spread of tomato mosaic.

The Mexical bean beetle spread throughout the southeastern quarter of the State in 1925. Experiments show that the use of calcium arsenate and hydrated lime is the most practical means of control for both this pest and the striped cucumber beetle.

A practical and economical spray for the control of biting flies attacking cattle, developed at the station, is prepared by mixing 1 pint of oil of tar with 1 gal. of used crank-case oil. Under usual conditions one spray applied in the morning after milking is sufficient to protect the cows for a 24-hour period.

[Work in entomology at the Michigan Station] (*Michigan Sta. Rpt. 1926, pp. 19, 20*).—Brief reference is made to the occurrence of and work during the year with the several insects of importance, including the hemlock looper (*Ellopia fiscellaria*), striped cucumber beetle, spotted cucumber beetle, codling moth, stings on fruits (E. S. R., 55, p. 155), June beetle, etc.

[Report of work in entomology at the Tennessee Station], H. L. Fackler (*Tennessee Sta. Rpt. 1926, pp. 32–34*).—In control work on the underground form of the woolly aphid, tests were made of paradichlorobenzene, coal tar, and crude naphthalene, 2,314 1- and 2-year-old trees being used. The paradichlorobenzene and crude naphthalene applications were made, for the most part, at the rate of 0.25 to 0.5 oz. to every 4 in. of space in the row along the side of the trees. The coal tar was applied at the rate of 2 to 3 oz. in the row for every 4 in. of space. This material was applied within 2 in. of the trees on both sides and at a depth of about 2 in., in order to bring it near the level of the crown, thus making possible the control of the infestation near the top of the ground as well as deeper. Several applications of these materials were made during the fall, and in some cases they were applied several times on the same block of trees, in other cases only once. The results show that paradichlorobenzene, although highly toxic to the trees, gave excellent control. With coal tar some very good results were obtained, and it is pointed out that this material should be tried again. Crude naphthalene did not prove to be very satisfactory as a control measure.

The potato leafhopper having been found to be doing considerable damage to alfalfa on the station farm, sweepings were made from injured plants. Within three days after such sweepings were placed in cages over undamaged alfalfa, yellowing of the plants occurred, while the check cage plants remained uninjured.

The cotton leaf worm made its appearance in the vicinity of the station on August 23. By September 18 the worms had increased to such numbers that dusting was found to be necessary.

The grub of what appears to be a chrysomelid of the genus Fidia or Typophorus was a source of damage to sweet potatoes by making furrows in the roots about ⅛ in. in diameter. It is stated that considerable complaint was received during the year from western Tennessee regarding flea beetle injury to sweet potatoes.

Report of the entomologist, D. T. Fullaway (*Hawaii Bd. Commrs. Agr. and Forestry [Bien.] Rpt., 1925–26, pp. 39–47*).—This report, covering the biennial period ended December 31, 1926, deals with the propagation and distribution of beneficial insects; the introduction of beneficial insects; depredations by *Coptotermes formosanus* and *Cryptotermes piceatus*; a brood disease very destructive to bees on the island of Kauai, which resembles sac brood;

lantana and other noxious weed suppression through insect attack; the appearance of a venomous spider, *Latrodectes mactans*, on the island of Oahu; and the appearance of the Australian tomato weevil *Listroderes apicalis* on the island of Hawaii.

[Insect pests in Devon] (*Seale-Hayne Agr. Col. Pamphlet 21 (1927), pp. 11, 15–27*).—Observations on the cabbage gall weevil (*Ceuthorrhynchus pleurostigma* Marsh), the azalea leaf miner (*Gracilaria azaleella* Brants.), and narcissus flies in 1926 are noted.

Economic insects in Sweden in 1922–1926 [trans. title], O. LUNDBLAD (*Meddel. Centralanst. Försöksv. Jordbruksomradet* [Sweden], *No. 317* (*1927*), *pp. 57, fig. 1*).—This is a report of the occurrence of insects of economic importance in Sweden during a period of 5 years. Brief reference is also made to other pests, including birds, mammals, etc.

[Report on work done in the entomological section during the years 1924–25 and 1925–26], K. KUNHI KANNAN (*Mysore Dept. Agr. Rpts. 1924–25, pt. 2, pp. 9–11; 1925–26, pt. 2, pp. 11–13*).—The insects referred to in these reports (E. S. R., 54, p. 753) include *Amsacta albistriga* Walk., sugar cane borer, mango hoppers (*Idiocerus* spp.), rhinoceros beetle, coffee borer (*Xylotrechus quadripes*), lime tree or citrus borer (*Chelidonium cinctum*), ladybird beetle on potato, and the average pod borer (*Adisura atkinsoni*).

Morphology and mechanism of the insect thorax, R. E. SNODGRASS (*Smithsn. Misc. Collect., 80 (1927), No. 1, pp. 108, figs. 44*).—Anatomical studies are reported upon.

A device for determining the relative degree of insect occurrence, E. A. MCGREGOR (*Pan-Pacific Ent., 3 (1926), No. 1, pp. 29–33, fig. 1*).—The author describes a pest gauge which he has perfected and used during two seasons in citrus thrips studies. Considerable data have been accumulated which indicate that this device is of real value in scoring varying degrees of pest occurrence.

Physical properties of commercial dusting and spraying materials, L. R. STREETER (*New York State Sta. Tech. Bul. 125 (1927), pp. 12*).—The author reports upon experimental work, including gelatin solution tests of lead arsenate, packing of lead arsenates in the sieves, sieve analyses of mixed dusts, electrification of dust particles, and screening tests to grade tobacco dusts.

In the past, screening tests for particle size measurements of arsenicals and sulfur dusts have been unreliable and unsatisfactory due to packing in the sieves. This condition, it is pointed out, is due to frictional electricity, and it was found that by removing the electric charge more satisfactory results can be obtained. Sulfur dust becomes electrified in the process of screening, but when mixed with lead arsenate in the proper proportion it passes through the sieves free from electrical excitation. Thus, lead arsenates 70 to 90 per cent of which failed to pass a 200-mesh sieve were screened through a 325-mesh sieve without difficulty when mixed with sulfur. Sieve analyses of sulfur dusts become more accurate when the sulfur is freed of the electric charge caused by friction in the screening process. Tobacco dusts are not as fine as other dusting materials, and screening tests are considered sufficiently accurate for particle size measurements.

Chemical testing of nicotine dusts, R. M. HIXON and C. J. DRAKE (*Iowa State Col. Jour. Sci., 1 (1927), No. 3, pp. 373–377, figs. 3*).—The authors conclude that the method proposed by Thatcher and Streeter (E. S. R., 49, p. 551) for chemical testing of the efficiency of various carriers for nicotine dusts is not reliable. An apparatus is described for analyzing the nicotine vapor evolved from a dust, and results are reported on the toxicity of this vapor to insects. The evidence indicates that nicotine decomposition at various rates in the dust is due to oxidation.

Laboratory and field experiments on the use of 3 : 5-dinitro-o-cresol and the sodium salt for winter spraying, C. T. Gimingham and F. Tattersfield (*Jour. Agr. Sci.* [*England*], *17* (*1927*), *No. 2, pp. 162–180, fig. 1*).—This is a report of investigations conducted at the Rothamsted Experimental Station.

The toxicity of 3 : 5-dinitro-o-cresol and its sodium salt to the eggs of several species of moths was determined under laboratory conditions. Both substances appeared to be toxic to eggs at concentrations varying from 0.1 to 0.025 per cent. With eggs of some insects, hatching is not entirely prevented by the action of low concentrations of dinitrocresol and sodium dinitrocresylate, but the majority of the larvae which emerge succumb within a few hours. The eggs of "red spider" are very resistant to the action of dinitrocresol. At equivalent concentrations, dinitrocresol and sodium dinitrocresylate have approximately the same toxicity to insect eggs. Washing eggs with water after spraying has no appreciable effect on the toxicity of dinitrocresol if the liquid is first allowed to dry on the eggs. Sodium dinitrocresylate is more affected by washing after spraying. Field experiments on apples and black currants with spray fluids containing dinitrocresol at a concentration of 0.25 per cent and sodium dinitrocresylate at equivalent concentration showed that both materials were completely effective against psylla and aphid eggs and greatly reduced the number of caterpillars. There was no evidence of any effect on capsid eggs. Both fluids had a cleansing effect on the bark of the trees, killing algae, lichens, etc.; they caused no injury to the trees themselves. The results demonstrate the practicability of using dinitrocresol and sodium dinitrocresylate as winter spray fluids on dormant trees and bushes under field conditions.

On the control of glasshouse insects with calcium cyanide, H. W. Miles (*Ann. Appl. Biol.*, *14* (*1927*), *No. 2, pp. 240–246*).—The author's experiments made in Great Britain during 1925–26 indicate that calcium cyanide is a satisfactory source of hydrocyanic acid gas and can be used to control a number of the usual pests infesting glasshouse plants. *Trialeurodes vaporariorum* Westw. was held in check with dosages of $\frac{1}{12}$ to $\frac{1}{5}$ oz. per 1,000 cu. ft., and effectively controlled with dosages from $\frac{1}{4}$ to $\frac{3}{4}$ oz. per 1,000 cu. ft. according to the conditions prevailing. At least six species of greenhouse aphids were controlled with dosages varying from $\frac{1}{7}$ to $\frac{1}{3}$ oz. per 1,000 cu. ft. Thrips, of which four species were dealt with, were more difficult to control, apparently only the adults being affected by the hydrocyanic acid gas. Dosages of $\frac{1}{3}$ to $1\frac{1}{3}$ oz. per 1,000 cu. ft. killed varying percentages of the adults, and a series of fumigations were found to give satisfactory control. Two instances are cited where continued fumigations with calcium cyanide apparently resulted in control of mealy bugs on tomatoes and vines in Guernsey.

Pest destruction by aeroplane, A. E. Blake (*Sci. Prog.* [*London*], *21* (*1927*), *No. 84, pp. 688–691*).—This is a brief review of control work with insects that has been conducted through the application of insecticides by means of airplanes, together with a list of nine references to literature.

Studies of the immature stages of Manitoban Orthoptera, N. Criddle (*Roy. Soc. Canada, Proc. and Trans.*, *3. ser.*, *20* (*1926*), *Sect. V, pp. 505–525, pls. 4*).—The studies here reported include 31 species.

Yellowing of alfalfa caused by leafhoppers, F. R. Jones and A. A. Granovsky (*Phytopathology*, *17* (*1927*), *No. 1, p. 39*).—Experiments conducted in Wisconsin, where alfalfa yellows became unusually conspicuous on the second crop, demonstrated beyond doubt that *Empoasca fabae* was responsible for the condition.

Curly-top of squash, M. B. McKay and T. P. Dykstra (*Phytopathology*, *17* (*1927*), *No. 1, pp. 48, 49*).—A severe condition of squash found in many places

in Oregon, Washington, and Idaho in August, 1926, was readily and repeatedly produced in the greenhouse by the use of beet curly-top viruliferous leafhoppers, *Eutettix tenella*.

Concerning Stethoconus cyrtopeltis Flor. (Hem. Capsidae) as an enemy of Tingis pyri Fab. (Hem. Tingitidae) [trans. title], C. GAUTIER (*Bul. Soc. Ent. France, No. 2 (1927), pp. 26, 27*).—This is a brief note on a capsid observed to attack the pear tingid or lacebug in Châtillon-d'Azergues in Rhone.

[Citrus aphid studies] (*Fla. State Hort. Soc. Proc., 39 (1926), pp. 156–171*).—Papers are presented on New Facts about the Citrus Aphid and its Natural Enemies, by F. R. Cole (pp. 156–158); Another Year's Experience with the Citrus Aphis, by J. R. Watson (pp. 159–164); Snuff as an Insecticide, by R. L. Miller (pp. 165–168); and Factors Affecting the Control of the Green Citrus Aphid with Nicotine Dust, by W. W. Yothers and O. C. McBride (pp. 169–171). It is concluded by Miller that snuff, because of its low price and effectiveness as well as its good qualities as a fertilizer, promises to be one of the most satisfactory materials for combating the citrus aphid.

Butterflies of California, J. A. COMSTOCK (*Los Angeles: Author, 1927, pp. 334, pls. 63, figs. 92*).—This is a popular guide to a knowledge of the butterflies of California, embracing all of the 477 species and varieties at present recorded for the State. The work is illustrated with 63 full page color plates, showing all of the species known to inhabit the State and the majority of those occurring in the Southwest, together with half-tone and line illustrations depicting the life histories of western butterflies.

Destruction of the pink boll worm in Egypt [trans. title], C. B. WILLIAMS (*Bul. Union Agr. Égypte, 25 (1927), No. 178, pp. 51–56*).—A discussion of control work in Egypt.

Codling moth experiences in 1926, A. J. OLNEY (*Ky. State Hort. Soc. Trans., 1926, pp. 133–140*).—The author reports upon one of the most serious outbreaks of the codling moth that has occurred in Kentucky.

Late facts about the calyx spray, R. H. SMITH (*Better Fruit, 21 (1927), No. 10, pp. 8, 21*).—The data here presented supplement an account by the author previously noted (E. S. R., 55, p. 355).

Moth control to meet residue edict (*Better Fruit, 21 (1927), No. 10, pp. 11, 12*).—This account includes suggestions for the reduction of arsenate residue on sprayed fruit. The joint recommendations of Federal and State experts are included.

Effects of cold storage upon clothes moths, E. A. BACK and R. T. COTTON (*Refrig. Engin., 13 (1927), No. 12, pp. 365, 366*).—In this address to the American Society of Refrigerating Engineers in May, 1927, the authors call attention to the fact that cold storage at a temperature of from 40 to 42° F. furnishes absolute protection against clothes moths, although such temperatures may not kill the larvae. Data are given on the relative resistance of clothes moth adults, eggs, and larvae.

A study of the terminal abdominal structures of male Diptera (two-winged flies), F. R. COLE (*Calif. Acad. Sci. Proc., 4. ser., 16 (1927), No. 14, pp. 397–499, figs. 287*).—A report of anatomical studies conducted.

The growth of the larva of Calliphora erythrocephala as related to temperature and nourishment [trans. title], L. MUSCONI (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 18 (1925), pp. 95–115, figs. 8*).—This is a report of studies conducted in connection with a list of 18 references to the literature.

On the hibernation of some common flies [trans. title], E. ROUBAUD (*Bul. Soc. Ent. France, No. 2 (1927), pp. 24, 25*).—Brief notes are given on homo-

dynamic and heterodynamic types of hibernation in muscids as differentiated in a previous account.[1]

Bacteriophage isolated from the common house fly (Musca domestica), R. E. Shope (*Jour. Expt. Med., 45 (1927), No. 6, pp. 1037–1044*).—A bacteriophage active against four species of bacteria was found in a salt solution extract of house flies.

A* blackfly (*Simulium bracteatum*) *fatal to goslings, G. P. Walker (*Canad. Ent., 59 (1927), No. 6, p. 123*).—This is a brief reference to a black fly, *S. bracteatum*, which was found present in large numbers on the bodies of goslings at the Dominion Experimental Station at Fredericton, N. B. On July 8, 1926, at which time the author's attention was called to the loss in the flock, only 2 of the original 27 goslings remained alive.

***Simulium ornatum* Mg. attacking the teats of cows,** A. W. N. Pillers (*Vet. Rec., 7 (1927), No. 25, p. 529*).—A report of observations made in Denbighshire, Wales, and Cheshire, England.

The European corn borer, Pyrausta nubilalis Hübn.—II, A discussion of its seasonal history in relation to various climates, K. W. Babcock (*Ecology, 8 (1927), No. 2, pp. 177–193*).—In this account (E. S. R., 56, p. 859) the author makes a comparison between areas of various seasonal history and an analysis of the annual variation of abundance. He concludes that the individuals having different seasonal cycles are not "biological species" in the ordinary acceptation of the phrase. Different seasonal cycles in various areas are developed as the result of climatic impress, and are maintained by it. Fluctuations in abundance can occur annually in response to variations in climate, and are induced by changes which do not differ greatly in character for both one and two generation individuals. The effect even of annual fluctuations in climate tends to be cumulative in character.

A study of the toxicity of acid lead arsenate on the Japanese beetle (Popillia japonica Newm.), E. R. Van Leeuwen (*Jour. Agr. Research [U. S.], 34 (1927), No. 11, pp. 1043–1047*).—In the investigations reported various mixtures of lead arsenate were sprayed on smartweed and tested against 169 individual Japanese beetles. Observations were made as to the length of time of feeding, the area of foliage consumed, and the quantity of arsenic which caused death. The results obtained indicate that small dosages of available arsenic are lethal, and that in case of ordinary infestations control in the field will be obtained without great injury by beetles to sprayed foliage. It is pointed out by the author that the protection afforded by a spray of lead arsenate, as shown by the small quantity of foliage eaten, is the outstanding fact established as a result of these experiments.

The alimentary canal of the Mexican bean beetle, S. F. Potts (*Ohio Jour. Sci., 27 (1927), No. 3, pp. 127–137, figs. 20*).—An anatomical contribution from the Gipsy Moth Laboratory, Melrose Highlands, Mass.

Notes on the habits and development of the azalea leaf miner, Gracilaria azaleella Brants, B. M. Broadbent (*Jour. Wash. Acad. Sci., 17 (1927), No. 7, pp. 175, 176*).—This species, apparently a native of Japan, was introduced into the United States prior to 1912 on azaleas imported from the Netherlands. It has since become established in New York, New Jersey, Pennsylvania, Florida, and the District of Columbia. Brief notes on its habits are given.

A preliminary revision of some Charopsinae, a sub-family of Ichneumonoidea, or ichneumon-flies, II, H. L. Viereck (*Roy. Soc. Canada, Proc. and Trans., 3. ser., 20 (1926), Sect. V. pp. 173–186*).—This revision (E. S. R., 57, p. 264) includes keys to the subgenus Viereckiana of the genus Campoplegidea

[1] Bul. Biol. France et Belg., 56 (1922), No. 4, pp. 456–544.

and to the species of the remaining genera of Charopsinae. Twenty-one species from Canada are described as new.

The insects of central Europe, particularly Germany.—I, Hymenoptera.—I, The bees, social wasps, digger wasps, and cuckoo or gold wasps, H. Friese, edited by C. Schröder (*Die Insekten Mitteleuropas Insbesondere Deutschlands. Band I, Hymenopteren. 1 Teil, Die Bienen, Wespen, Grab- und Goldwespen. Stuttgart: Franckh'sche Verlagshdlg., 1926, vol. 1, pt. 1, pp. VI+192, pls. 8, figs. 107*).—The first section of this volume deals with the Apidae (pp. 3–127), the second section with the Vespidae (pp. 128–138), the third section with the Fossores (pp. 139–181), and the fourth section with the Chrysididae (pp. 182–188). An index to the genera and species and a bibliography of 72 titles are included.

***Notes on the nesting habits of some of the less common New England* bumblebees,** O. E. Plath (*Psyche, 34 (1927), No. 2, pp. 122–128, figs. 2*).—This is a report of further studies of the nesting habits of bumblebees (E. S. R., 51, p. 764).

Sex forms of honeybees, W. J. Nolan (*Jour. Wash. Acad. Sci., 17 (1927), No. 7, pp. 177, 178*).—A brief discussion of the subject.

The anatomy of the Italian race of the honey bee [trans. title], N. Cusciannna (*Bol. Lab. Zool. Gen. e Agr. R. Scuola Super. Agr. Portici, 18 (1925), pp. 37–78, figs. 16*).—This is a report of anatomical studies.

Acarine disease in hive bees: Its cause, nature, and control, J. Rennie (*North of Scot. Col. Agr. Bul. 33 (1927), pp. 34, pls. 5, figs. 2*).—A summary of information on this parasitic disease of bees.

Development of Habronema larvae in drosophilid flies, M. Crawford (*Jour. Compar. Path. and Ther., 39 (1926), No. 4, pp. 321–323, fig. 1*).—In studies in Ceylon the author found 4 of 31 pomace flies examined to harbor Habronema larvae. The 4 infested flies contained 2, 4, 9, and 10 nematodes, respectively.

ANIMAL PRODUCTION

The American Society of Animal Production.—Record of proceedings of annual meeting, December, 1924 (*Amer. Soc. Anim. Prod. Proc. 1924, pp. 217, figs. 11*).—This is the usual report of the annual meeting, held at Chicago in December, 1924 (E. S. R., 53, p. 570). The following papers were presented:

The President's Address, by E. A. Trowbridge (pp. 7–10); Some Factors Affecting the Feed Requirements of Suckling Sows and Litters, by Q. W. Wallace, J. M. Evvard, and C. C. Culbertson (pp. 11–20); What is the Best System of Measuring the Nutritive Energy of Farm Feeds in Practice? by E. B. Meigs (pp. 20–23); Improvements of Understanding and Method in Net Energy Determinations, by E. B. Forbes (pp. 23–29); Rickets and Partial Paralysis in Swine as Affected by Nutrition, by G. Bohstedt, W. L. Robison, R. M. Bethke, and B. H. Edgington (pp. 30–36); The Preparation of the Grain Sorghums and Other Small Grains for Fattening Swine, by C. P. Thompson (pp. 37–39); The Digestible Nutrients and Metabolizable Energy in Different Silages, by F. W. Christensen and T. H. Hopper (pp. 39–43); The Salt Consumption of Fattening Lambs, by J. M. Evvard, L. C. Brown, C. C. Culbertson, and W. E. Hammond (pp. 44–49); The United States Range Live Stock Experiment Station, by C. N. Arnett (pp. 50–54); An Experimental Study of Hogs Following Cattle, by J. M. Evvard and K. K. Henness (pp. 55–59); The Influence of the Method of Oil Extraction on the Feeding Value of Soybean Oilmeals, by W. L. Robison (pp. 60–63); Planning the Animal Husbandry Curriculum, by H. H. Kildee (pp. 63–67); Teaching Animal Husbandry Courses, by C. W. McCamp-

bell (pp. 67–70); Problems in Animal Husbandry Teaching and Research, by W. H. Tomhave (pp. 71–77); The Showing of Livestock by Colleges, by G. H. True (pp. 77–81); Report of a Special Committee to Formulate Plans for a Cooperative Study of the Factors Which Influence the Quality and Palatability of Meat, by F. B. Mumford et al. (pp. 81–83); Sex as a Factor in Beef Production, by H. J. Gramlich (pp. 83–89); Transmitting Ability of Dairy Sires, by W. W. Yapp (pp. 90–92); Some Phases of Wool Inheritance in F_1 Generation, by R. H. Burns (pp. 92–97); Nature's Scorecard for Feeder Steers, by J. L. Lush (pp. 98–101); Effect of the Use of Purebred Hampshire Rams on Character and Yield of Wool, by W. E. Hammond, J. M. Evvard, and C. C. Culbertson (pp. 101–105); Losses of Fattening Lambs in Colorado, by E. J. Maynard (pp. 105–109); Creamery Buttermilk and Commercial Buttermilk Feeds as Sources of Protein for Growing Pigs, by E. F. Ferrin and M. A. McCarty (pp. 110–113); Resistance of Chicks to Bacillary White Diarrhea, by E. Roberts and L. E. Card (pp. 113–115), previously noted (E. S. R., 54, p. 380); Seasonal Distribution of Twin Births in Cattle, by L. J. Cole and A. Rodolfo (pp. 116–118); Observations of British Livestock, Breeding Farms, and Livestock Shows, by W. A. Cochel (pp. 119–122); Observations on European Livestock Breeding Methods, by L. J. Cole (pp. 122–126); The Scottish Cattle Breeding Conference, by E. N. Wentworth (pp. 126–129); Coordination of Livestock Extension Work, by C. W. Warburton (pp. 129–132); What the Livestock Interests of the Southwestern Range States Expect from Research Workers and Teachers in Animal Husbandry, by C. F. Monroe (pp. 132–142); Conserving the Nation's Horse Power, by W. Dinsmore (pp. 142–146); A New Bacon-Hog Industry, by P. F. Trowbridge (pp. 146–150); The Organization and Teaching of a Meat Course, by M. D. Helser (pp. 150–154); The Protein Requirements of Fall Pigs, by C. C. Culbertson and J. M. Evvard (pp. 155–166); The Economic Situation in the Meat Industry, by A. T. Kearney (pp. 167–180); Economic Situation in the Sheep Industry, by W. B. Connell (pp. 180–183); The Beef Cattle Situation, by F. G. King (pp. 183–188); Cattle Feeding in Relation to Farm Management, by H. C. M. Case and K. H. Myers (p. 188), previously noted (E. S. R., 53, p. 88); Davenport as Dean and Director, by H. W. Mumford (pp. 189, 190); Dean Davenport and the Student Body, by J. V. Stevenson (pp. 190–193); Dean Davenport, the Man, by E. A. Burnett (pp. 194, 195); and Early Trials of the Agricultural Colleges and Experiment Stations, by E. Davenport (pp. 195–203).

General animal breeding, IV, C. Kronacher (*Allgemeine Tierzucht. Berlin: Paul Parey, 1927, 3. ed., rev. and enl., pt. 4, pp. XIX+660, pls. 4, figs. 293*).—This is a very complete and comprehensive treatise dealing with the scientific and practical aspects of the breeding of cattle, horses, sheep, hogs, and goats.

Fourth annual report [of the] National Live Stock and Meat Board, [1926–27], R. C. Pollock (*Natl. Livestock and Meat Bd. Ann. Rpt., 4 (1927), pp. 96, pl. 1, figs. 55*).—The fourth annual report of the board (E. S. R., 56, p. 466) contains brief results of research, dealing with the cooperative studies of the quality and palatability of meat, beef grading and stamping, meat for blood regeneration, iron content of meat, and the first meat judging contest at the 1926 International Livestock Exposition.

Management of range grazing land, J. T. Jardine, H. A. Lindgren, and E. L. Potter (*Oreg. Agr. Col. Ext. Bul. 397 (1927), pp. 16*).—The authors give in a simple form the available information on the care and handling of ranges. The class of stock to which the range is best suited, the grazing period, overgrazing, improving the stand of grass, and the management of cattle and sheep on the range are discussed.

Ensilage ([*Gt. Brit.*] *Min. Agr. and Fisheries, Misc. Pub. 59* (*1926*), *pp. 58, fig. 1*).—The history of silage, particularly as pertaining to England, is discussed. The types of silage, crops suitable for silage, and the making of silage in various types of silos are described. One section of the publication is devoted to the chemistry of silage, including changes which occur in the crop during ensilage and the losses of nutrients in the silo. The value of silage as compared with other feeds for livestock and the future of silage in England are among the topics considered.

Alba blood (*Indiana Sta. Rpt. 1926, p. 41*).—This by-product from printers' rolls composed chiefly of gelatin and having a protein content (N×6.25) of about 84 per cent has been found in tankages. It resembles dried blood, but biological analysis shows that the proteins are inferior in quality, having similar deficiencies as corn. It therefore constitutes an adulterant in tankage.

Analyses of commercial feeding stuffs and registrations for 1927, C. S. CATHCART (*New Jersey Stas. Bul. 449* (*1927*), *pp. 96*).—The guaranteed and found analyses for protein, fat, and fiber of the commercial feeding stuffs as inspected in New Jersey during the year 1926, are given, including a list of the principal ingredients identified microscopically (E. S. R., 55, p. 664) and a list of registrations for 1927.

The fattening of steers on dry-land crops, J. L. LANTOW, W. H. BLACK, and D. R. BURNHAM (*New Mexico Sta. Bul. 156* (*1926*), *pp. 17, figs. 5*).—The work reported, conducted in cooperation with the U. S. D. A. Bureaus of Animal Industry and Plant Industry, is divided into two parts, steer feeding covering a 1-year period and calf feeding covering 2 years' results. There is also appended a section on crop data, including comparisons of land preparation methods for milo and kafir, spacing and date-of-planting tests with milo, and variety tests with sorghums, sorgos, kafir, milo, and Sudan grass.

In continuation of the work with yearlings (E. S. R., 55, p. 464), it was found that the largest and cheapest gains were made by a lot receiving milo, cottonseed meal, and Sumac sorgo fodder. Cowpea hay proved more efficient than cottonseed meal in producing gains when fed with ground milo and Sumac sorgo silage. The lots receiving Sumac sorgo fodder made cheaper gains than those receiving Sumac sorgo silage.

Two years' work with calves fed rations similar to the above showed that the lot fed cowpea hay, silage, and milo made the most economical gains. The lot in which the hay was replaced with cottonseed meal made the most expensive gains, but this lot showed the most finish and brought the highest prices upon the market. The lot fed fodder made the most economical use of milo, but the least so of cottonseed meal.

Sheep production, L. J. HORLACHER (*New York and London: McGraw-Hill Book Co., 1927, pp. X+418, figs. 137*).—This book deals with the history and development of sheep production in this and other countries, the anatomy, the judging, and the principles of feeding. The history, origin, and description of the principal breeds are discussed, and the problems of management, breeding, feeding, and marketing are pointed out. Appended is a glossary of sheep and wool terms.

Lamb-feeding experiments [at the Umatilla Field Station, Hermiston, Oreg.], H. K. DEAN (*U. S. Dept. Agr., Dept. Circ. 422* (*1927*), *pp. 15–20, fig. 1*).—Starting during the winter of 1922–23 and for the two subsequent winters a carload of lambs was divided into lots of 50 lambs each and fed to ascertain the practicability of marketing hay by feeding it to lambs, and also to determine the relative value of corn, wheat, oats, and barley as grain for fattening lambs

During the first year, the various grains were compared, but in the second and third years the amounts of grain fed with the hay were varied from 0.5 lb. to 1.4 lbs. per head per day. The lambs were fed all of the hay they would clean up.

The results of the first year's work show that taking barley as a standard, corn was worth 8 per cent more, wheat 3 per cent less, and oats practically equal in value. For the other years, the lots receiving 1 lb. of grain made the largest total gain. Since the primary object of the test was to determine the value of marketing hay by means of lambs, it was decided from the results obtained that the long feeding periods used were a practical and economical means of disposing of the hay. This method of feeding allowed the lambs to be carried for a long period on hay alone and then finished by a shorter feed on grain.

[Wintering farm work horses] (*Michigan Sta. Rpt. 1926, p. 14*).—Five work teams received alfalfa hay and corn stover as roughage during the winter feeding. As the work season approached a light feed of ear corn was added. Half of the horses received silage and the other half carrots. Carrots proved more valuable pound for pound than silage as feed for idle work horses. The use of these feeds made it possible to winter horses at a rate as low as 13 cts. per day.

The French-Canadian horse, G. A. Langelier (*Canada Dept. Agr. Bul. 87, n. ser. (1927), pp. 22, figs. 7*).—The early history, development, points of excellence, and scale of points for the French-Canadian horse are described. The records of breeding work at the two stations where these horses are being developed are reported, giving the type of stallions and mares used and the results of inbreeding, line breeding, and out-crossing. Feeding, housing, and management as phases of the horse industry are described.

Records were kept of the feed used for rearing 15 colts and fillies from weaning time until they were ready to work, at an average age of 32 months 26 days, at which time they averaged 1,240 lbs. in weight. It required 9,992 lbs. of hay, 4,632 lbs. of oats, 4,178 lbs. of bran, and 216 days of pasture per animal. For maintaining work horses averaging 1,253 lbs. in weight, it required 3,744 lbs. of hay and 3,664 lbs. of concentrates for 233 days. During five consecutive winters, records were kept on the feed required to winter idle mares and geldings, and it was found that they fared well on a daily ration of 1 lb. of mixed hay, 1 lb. of oat straw, and 1 lb. of carrots or swedes per 100 lbs. live weight.

[Poultry experiments at the Indiana Station] (*Indiana Sta. Rpt. 1926, pp. 37, 38, fig. 1*).—Two experiments are noted.

Is scratch grain necessary?—Two lots of pullets were fed the standard Purdue laying ration. In lot 1 the scratch grain was scattered in the litter and in lot 2 it was ground, mixed with the mash, and fed in hoppers. Both lots received small amounts of sprouted oats daily. The pullets averaged 120 and 146 eggs for nine months in the respective lots.

Yellow corn for chicks.—Three lots of chicks were fed varying amounts of white and yellow corn. Lot 1 received white corn alone, lot 2 equal parts of white and yellow corn, and lot 3 all yellow corn. Both lots 2 and 3 grew well up to 20 weeks of age. Lot 1 grew slowly, after a few weeks developed ophthalmia, and all died in about 4 months.

[Experiments with poultry at the Ohio Station] (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 120–127*).—The results of two experiments are briefly noted.

Solving the green feed problem, D. C. Kennard and R. M. Bethke.—In continuing this study (E. S. R., 55, p. 671), high-quality alfalfa leaf meal fed at the rate of from 5 to 10 per cent of the ration by weight is being found a satisfactory substitute for hay. Groups of layers fed good quality legume hay

from November to May laid practically the same number of eggs as those that had access to bluegrass range when the weather permitted. Another group without either hay or range laid only 70 per cent as many eggs, and the hatchability of these eggs was reduced from 57 to 36 per cent. Cod-liver oil fed at the rate of 2 per cent of the ration brought about a marked increase in egg production and also improved the shell texture. Groups fed cod-liver oil had an average hatchability of 32 per cent as against 36 per cent for groups receiving no cod-liver oil.

The antirachitic properties of cod-liver meals, R. M. Bethke.—Five lots of 62-day-old White Leghorn chicks were placed in indoor pens without direct sunlight. The basal ration for all lots consisted of yellow corn, wheat middlings, dried buttermilk, meat meal, calcium carbonate, and salt. This ration was fed to lot 1. In lots 2, 3, and 4 the meat meal was replaced by cod-liver meal from different sources, and in lot 5, 2 per cent of cod-liver oil was added. After 6 weeks of feeding, representative birds from each lot were killed for analysis of the tibia bones. The cod-liver oil meals varied in their ability to prevent leg weakness. One meal was no better than the meat meal in the basal ration, and another was practically equal to cod-liver oil. Since there was a difference in the residual fat content of the meals, they were fed on the same extract basis, and it was found that the degree of protection bore no relation to the fat content.

The basal metabolism of mature chickens and the net-energy value of corn, H. H. Mitchell and W. T. Haines (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, pp. 927–943*).—Continuing this experiment (E. S. R., 56, p. 372), it was found that the average basal heat production of 28 nonlaying hens was 54.9 calories per day per kilogram of body weight and 703 calories per day per square meter of body surface. For 19 mature cockerels the averages were 55.7 and 806 calories, respectively. There were also indications that the basal metabolism of the laying hen is higher than that of the nonlaying.

In experiments with mature Rhode Island Red chickens 100 gm. of corn (91 per cent dry matter) gave an average heating effect of 50.7±1.2 calories. These experiments showed that while over half of the extra heat produced by feeding corn is eliminated in the first 24 hours, the postabsorptive condition is not fully established until 48 hours have elapsed.

The net energy value of corn for mature chickens was found to be 3,110 calories per kilogram (1,411 calories per pound) of dry matter.

The effect of age, sex, and castration on the basal heat production of chickens, H. H. Mitchell, L. E. Card, and W. T. Haines (*Jour. Agr. Research [U. S.], 34 (1927), No. 10, pp. 945–960*).—Several different breeds of chickens were studied in this experiment, using the apparatus previously explained (E. S. R., 57, p. 368). The metabolism per unit of surface is distinctly lower at hatching time than at maturity. After hatching it rises rapidly to a maximum and then decreases to the adult level, at which it remains for the greater part of life. For chicks the peak is reached at 30 to 40 days of age and the adult level at about 70 to 80 days. The basal metabolism per unit of weight decreases from the peak age to at least one year of age.

The basal metabolism of cockerels eventually becomes higher than that of pullets, but the age at which sex differences appear has not been determined. The average basal metabolism for a group of White Plymouth Rock chickens ranging from 72 to 363 days was for the cockerels 852±12 calories per day per square meter of surface and 805±10 calories for the pullets. At advanced ages there is a reduction of from 6 to 12 per cent in the basal heat production for cocks and hens, respectively. Castration of cockerels lowers their basal metabolism, though the effect may not be immediate and may extend over a period of

several months. The average maximum effect of castration in this test was a reduction of 13.5 per cent in basal metabolism.

Mineral metabolism of the growing chick, F. E. MUSSEHL, M. J. BLISH, and C. W. ACKERSON (*Poultry Sci., 6 (1927), No. 5, pp. 239–242, fig. 1*).—This test was undertaken at the Nebraska Experiment Station to determine the effect of feeding excessive amounts of calcium and phosphorus to growing chicks. Five lots of 25 Single Comb White Leghorns each were used in the experiment. All lots were irradiated twice a week for about one hour with a quartz mercury vapor lamp. The lots were fed by the all-mash method. The basal ration consisted of yellow corn meal, ground wheat, yeast, cod-liver oil, meat and bone meal, and cornstarch. The total calcium and phosphorus content of this ration was 3.018 and 2.147 per cent, respectively. A second lot received in addition 4 parts of a mineral mixture composed of 60 per cent raw bone meal, 20 per cent calcium carbonate, and 20 per cent common salt. A third lot received 8 parts of raw bone meal, and a fourth and fifth lot 4 and 8 parts of calcium carbonate, respectively. The feeding period lasted 8 weeks.

The rate of growth in the basal ration group was quite satisfactory, indicating that it was complete for vitamins, proteins, and minerals, though one case of rickets did develop. The addition of the mineral mixture did not improve the ration, but actually retarded growth. There were 4 deaths in this group. Adding raw bone meal still further retarded growth, and 19 cases of typical rickets and 1 death appeared. Four parts of calcium carbonate proved to be a check on the rate of growth, and 8 parts showed but little growth. The mortality in these last two lots was 10 and 19, respectively.

Do growing chicks require a vitamin B supplement to a mixed grain ration? T. S. HAMILTON, L. E. CARD, and C. H. KICK (*Poultry Sci., 6 (1927), No. 5, pp. 243–248*).—In this experiment at the Illinois Experiment Station (E. S. R., 56, p. 270) dried yeast and dried alfalfa leaves were selected as vitamin supplements containing large quantities of vitamin B. The basal ration was so arranged that these supplements could be substituted for feeds of similar chemical composition. This ration consisted of 60 per cent of ground whole grains (corn, oats, and wheat) and 20 per cent of other seed products (wheat bran and soy bean oil meal) with adequate protein, mineral, and fat-soluble vitamin supplements. The dried yeast was substituted for an equal percentage of soy bean oil meal, and the alfalfa leaves for wheat bran. Six lots of 20 Rhode Island Red 8-week-old chicks, using duplicate lots for each ration, were fed for 21 weeks. One group on each ration was fed in the nutrition laboratory out of direct sunlight, and the other groups were fed at the poultry plant.

The basal ration was not appreciably deficient in vitamin B for growing chicks. The addition of yeast and alfalfa leaves did not improve the ration for chicks grown outdoors. There was an indication that yeast improved the ration slightly for the laboratory chicks, though alfalfa leaves were without appreciable effect.

Growing chicks, C. W. CARRICK (*Purdue Agr. Ext. Bul. 137, rev. ed. (1927), pp. 19, figs. 10*).—The management, feeding, housing, and care of baby chicks is described with the reproduction of the poultry flock in view.

Care and feeding of growing chicks, J. A. HANNAH (*Mich. Agr. Col. Ext. [Bul.] 52 (1927), pp. 15, figs. 4*).—This consists of practical directions for handling chicks in the brooder and the feeding of growing chicks.

How to raise the chicks, G. S. VICKERS (*Ohio Agr. Col. Ext. Bul. 59 [1927], pp. 24, figs. 8*).—A revision of work previously noted (E. S. R., 48, p. 873).

Feeding for eggs, C. M. FERGUSON (*Mich. Agr. Col. Ext. Bul. 51 (1927), pp. 12, figs. 2*).—Rations which have proved successful in egg-laying contests

are suggested in this article. Winter and summer feeding schedules are also given. The value of the various nutrients in the ration is described.

Further studies of the monthly egg record of birds which die during the first laying year, J. A. HARRIS (*Poultry Sci.*, *6* (*1927*), *No. 5*, *pp. 215–224*).—The data here presented deal with the differences in the mean monthly egg production and in the variability of monthly egg production of birds which died at some time during the first laying year and of those which survived throughout this period. The materials were drawn from the records for the period 1911–12 to 1921–22 of the international egg-laying contest at Storrs, Conn., and refer to the Rhode Island Red and White Wyandotte breeds.

The constants show that in both breeds the mean egg production is lower and the variability of egg production is higher in birds that subsequently died than in birds which survived. This would tend to show that the relationship between egg record and mortality is definite but highly complex. The author believes that three groups of factors may influence the interrelationships: (1) Low egg production may be associated with low physical condition, which ultimately finds expression in death; (2) conditions of morbidity induced by causes largely independent of constitutional vigor may tend to lower egg production and to shorten life; (3) excessive egg production may so lower vigor as to be a direct or contributory cause of subsequent death. The results of this study have a commercial aspect, since they show that the loss due to mortality is not merely the loss of the birds which die, but also a loss due to decreased egg production in the period preceding death.

Raising turkeys in partial confinement, F. D. BROOKS (*Poultry Sci.*, *6* (*1927*), *No. 5*, *pp. 233–236*, *fig. 1*).—A test has been undertaken at the Indiana Experiment Station to determine the best method for producing turkeys under the conditions which prevail in the State. The methods of incubating, management, and feeding during the years 1922 and 1923 are described. It has been found that blackhead is the chief cause of loss in the flocks.

The results show that the turkey is a more efficient producer of meat than the chicken. In this test 6-month-old turkeys required an average of 3 lbs. of feed to produce 1 lb. of gain, while Plymouth Rock and Rhode Island Red chicks of the same age require from 5.5 to 6 lbs. of feed for the same gain.

Rabbit raising, H. M. BUTTERFIELD and W. E. LLOYD (*Calif. Agr. Col. Ext. Circ. 9* (*1927*), *pp. 56*, *figs. 17*).—A popular publication on the breeds, breeding, housing, feeding, management, diseases and care, killing, skinning, and dressing rabbits as a commercial proposition.

Principles of fur farming: How to successfully raise fur-bearing animals for commercial purposes, ROBINSON, HEALEY, STAHL, and BUNT (*Kansas City, Mo.: Outdoor Enterprise Pub. Co.*, *1926*, *pp. 154*, *figs. 65*).—A practical guide for the successful raising of fur-bearing animals for commercial purposes. The housing, breeding, feeding, killing, and skinning of various animals that are valuable for their fur are discussed in detail. Especial attention is directed to foxes, muskrats, and rabbits.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Indiana Station] (*Indiana Sta. Rpt. 1926*, *pp. 25*, *26*).—Results of two experiments are noted.

Native corn v. southern corn for silage.—Feeding trials indicated that native or field corn produces more milk per unit of silage than southern or prolific corn but that the larger tonnage per acre of the latter more than offsets the increased yield of milk.

The value of grinding dairy feeds.—The use of cracked corn reduced the indigestible dry matter in the feces from 18.6 to 4.5 per cent and of oats from 5.5 to 0.4 per cent.

[Experiments with dairy cattle at the Michigan Station] (*Michigan Sta. Rpt. 1926, p. 6*).—The continuation of work previously noted (E. S. R., 55, p. 571) indicates that the importance of adding minerals to dairy rations has been overemphasized. Certain minerals, such as raw rock phosphate and the complex mixture used in this experiment, have proved detrimental.

It has been found that calf rations low in calcium will furnish enough of the mineral for growth. The quantity and quality of hay fed is more important than a mineral supplement in supplying calcium for health and reproduction.

Dairying industry of New Zealand, H. Belshaw (*Econ. Geogr., 3 (1927), No. 3, pp. 281–296, figs. 20*).—The author reviews the history and development of the dairy industry in New Zealand. The geographic and climatic conditions that favor the industry, the distribution, organization, marketing, and economic and social importance of the industry are dealt with.

Apple pomace silage for milk production, F. W. Atkeson and G. C. Anderson (*Idaho Sta. Bul. 150 (1927), pp. 24, figs. 2*).—Tests were run in 1924–25 and 1925–26 to determine the value of apple pomace silage as compared with corn silage. Two lots of 5 cows each were used in the first trial and 4 cows per lot in the second trial. The test in each case covered a period of 96 days, consisting of 3 25-day periods with each period preceded by a 7-day preliminary period. The milk was weighed and tested for butterfat at each milking.

During the preliminary tests the cows were fed all the alfalfa hay they would consume and grain in proportion to the milk. During the experimental periods the hay and silage were standardized and kept at a constant level throughout the period. The grain was fed at the rate of 1 lb. to 3 lbs. of milk produced in the case of Holsteins and 1 lb. to 2.5 lbs. in the case of Jerseys. The grain mixture was the standard herd ration. One group of cows in each experiment was fed during the first period on corn silage and the other on apple pomace silage. These feeds were reversed in the second period and again in the third period.

The results of these experiments show that apple pomace silage was equal to corn silage in the production of milk and butterfat. The cows maintained their weight on both rations. Apple pomace was very palatable, and the cows ate it readily. It was found that feeding apple pomace just before milking caused an off flavor in the milk, and that the odor was also absorbed from the air of the stable. This condition was easily overcome by feeding the pomace immediately after milking.

The Pennsylvania Association of Dairy and Milk Inspectors second annual report, 1926, compiled by W. W. White (*Penn. Assoc. Dairy and Milk Insp. Ann. Rpt., 2 (1926), 1–176, pls. 2, figs. 14*).—This report of the association meeting held at Harrisburg, Penn., in January, 1926, contains numerous papers and other materials, as follows: Presidential Address, by T. W. Henderson (pp. 24–26); Food Control Work with Reference to Milk Control, by J. W. Kellogg (pp. 27–32); Present Status and Future of the Tuberculosis Prevention and Eradication Work in Pennsylvania, by S. E. Bruner (pp. 33–41); Recording Thermometers, by R. E. Irwin (pp. 43–57); Report of the Committee on Communicable Diseases Transmitted Through Milk, by J. F. Shigley, J. H. Farrell, and C. W. Smith (pp. 58–62); Building a New Plant and Getting Business, by R. D. Snyder (pp. 63–67); The Dairymen's League Cooperative Association, by R. E. Van Cise (pp. 68–73); Report of Field Work Done by the

Division of Milk Control During 1925, by J. R. Kilborn (pp. 74–76); Ventilation of Dairy Barns a Vital Factor in Milk Production, by R. U. Blasingame (pp. 77–80); A Practical Course in Sanitary Milk Control, by W. J. Lewis (pp. 81–85); Report of Committee on Hygiene and Dairy Methods, by G. W. Grim et al. (pp. 86–96); The Medical Examination of Milk Handlers, by W. G. Turnbull (pp. 97–106); The Work of the Dairy Council in Quality Control, by C. I. Cohee (pp. 107–110); How Washington, Penn., Prepared and Passed a Milk Ordinance, by N. C. Craig (pp. 111–115); The Bacteriological Content of Washed Milk Bottles, by J. W. Rice et al. (pp. 116–121); Studies on Pasteurization, by W. T. Johnson, jr. (pp. 122–126); Report of the Committee on Pasteurization, by R. E. Irwin et al. (pp. 127–155); A Small Borough Milk Supply, by C. R. Hostetter (pp. 156–158); Remodeling Old Barns as an Aid to the Production of Clean Milk, by E. G. Lantz (pp. 159–162); Relation of Our Vocational Schools to the Milk Supply, by H. C. Fetterolf (pp. 163, 164); Report of Meeting of Pennsylvania Public Health Association at Mont Alto, by S. Youngman (pp. 165–168); and Legal Questions Concerning Milk Control, by J. N. Lightner (pp. 169–172).

The Pennsylvania Association of Dairy and Milk Inspectors third annual report, 1927, compiled by W. W. White (*Penn. Assoc. Dairy and Milk Insp. Ann. Rpt., 3 (1927), pp. 1–173, pls. 2, figs. 18*).—This report of the association meeting held at Pittsburgh, Penn., in January, 1927, contains numerous papers and other material, as follows: Presidential Address, by T. W. Henderson (pp. 19–24); Enforcing Pennsylvania's Milk Laws, by J. W. Kellogg (pp. 25–29); Progress of Bovine Tuberculosis Eradication in Pennsylvania, by S. E. Bruner (pp. 30–35); A City Milk Supply from Tuberculin Tested Herds, by H. B. Mitchell (pp. 36–42); Recording Thermometers, by R. E. Irwin (pp. 43–57; Ten Years of Public Health Work, by J. H. Farrell (pp. 58–63); Municipal Co-operation in Milk Supervision, by W. W. White (pp. 64–67); Report of the Committee on Communicable Disease Transmitted Through Milk, by J. F. Shigley et al. (pp. 68–71); Report of the Committee on Methods for the Bacterial Analyses of Milk and Milk Products, by J. W. Rice et al. (pp. 72–82); Photographic Records of Bacteriological Findings in Routine Milk Analyses, by W. T. Foster (pp. 83–87); Some Difficulties Encountered in Supervising a Public Milk Supply under Present Regulations, by C. R. Hostetter (pp. 88–91); Greetings from Dr. Theodore B. Appel (pp. 92, 93); Cooperation in Milk Control, by C. H. Miner (pp. 94–96); Milk-Borne Typhoid Fever and the Rôle of the Human Carrier, by C. Armstrong (pp. 97–103); Who Are My Competitors? by H. K. Dugdale (pp. 104–111); Report of the Committee on Hygiene and Dairy Methods, by C. I. Cohee et al. (pp. 112, 113); Cooling Milk, by T. J. McInerney (pp. 114–123); Report on Field Work of the Division of Milk Control during 1926, by H. E. Shroat (pp. 124–128); The Dairy Council in Pennsylvania, by H. B. Steele (pp. 129–133); Associated Activities in the Ice Cream Industry, by R. C. Hibben (pp. 134–139); The relation of Concrete to Clean Milk Production, by N. S. Grubbs (pp. 140–142); Report of Committee on Pasteurization, by R. E. Irwin et al. (pp. 143–164); and The Electropure Process, by H. J. Bailey (pp. 165–168).

A guide to quality in dairy products, E. H. Farrington (*Madison, Wis.: Mendota Book Co., 1927, pp. [7]+247, pl. 1*).—This is a guidebook for the butter maker, the cheese maker, the ice cream maker, and the dairy farmer, especially as related to producing a product of good quality.

The production and distribution of clean milk, A. T. R. Mattick (*London: Dairyman, Ltd., 1927, pp. 76, figs. 26*).—After explaining what constitutes clean milk, the author describes the kind and condition of buildings that are necessary for its production. The care of utensils, methods of raising steam for farm

sterilization, milking, straining and cooling milk, milk containers, bacteriological standards, and the distribution of clean milk are among the subjects discussed.

Clean and cold milk, R. S. BREED (*New York State Sta. Circ. 93 (1927), pp. 4, figs. 4*).—This is a popular compilation from work previously noted (E. S. R., 29, p. 878; 34, p. 183; 39, p. 76; 47, p. 480.)

Oiliness in milk, A. T. R. MATTICK (*Jour. Agr. Sci. [England], 17 (1927), No. 3, pp. 388–391*).—"Oiliness," sometimes referred to also as "castor oil flavor," appears late in autumn and continues through the winter and early spring, but never appears in summer. In the experiments described in this paper, oiliness could not be reproduced by any organism or group of organisms isolable from "oily" milk. The production of this flavor was finally traced to exceedingly minute quantities of copper, such as are introduced into the milk from tinned copper coolers having small patches of the tinning worn away. Oxygen was found also necessary to the development of the flavor. So far from causing oiliness, the bacteria normally present in milk appear at summer temperatures to inhibit the development of the flavor. Oiliness is considered not identical with other flavors produced by larger, though still minute, quantities of copper.

[Quality and composition of butter] (*Indiana Sta. Rpt. 1926, pp. 26, 27, fig. 1*).—Samples numbering 981 and representing 123 different brands of butter were purchased on the retail market and analyzed with the following results: (1) A mold and yeast content generally high indicating a need for increased attention to pasteurization of cream and sanitation in manufacturing, (2) an apparent slight negative relationship between yeast content and score, (3) no apparent relationship between mold content and score, (4) yeast content a better index of methods of manufacturing than mold content, (5) a positive relationship between moisture content and yeast content, (6) fully one-half the prints unsatisfactory in regard to net weight, and (7) a need for greater standardization of composition.

Viability of pathogenic organisms in butter, A. E. BERRY (*Jour. Prev. Med., 1 (1927), No. 6, pp. 429–442, fig. 1*).—Samples of butter were inoculated with several pathogenic organisms both on the surface and by mixing through the mass.

In almost every case there was an immediate decline in the number of bacteria present in the sample. The most rapid decrease occurred during the first few days of storage. The organisms studied showed a wide variation of viability in butter, some surviving but a few days' storage while others were able to survive for a period of 7.5 months. These data demonstrate that butter can not be disregarded as a source for the spread of disease.

A study of the sanitary significance of air in relation to ice cream, F. W. FABIAN (*Michigan Sta. Tech. Bul. 83 (1927), pp. 30, fig. 1*).—The work reported is divided into two parts.

I. *A study of the bacteria in the air of an ice cream plant* (pp. 3–19).—Tests were made during each month of the year to determine the number of bacteria in the air in the room where the ice cream was mixed, pasteurized, homogenized, cooled, and frozen. The fewest bacteria were found during January and the most in April. Weather was the most important factor in determining the number of bacteria present. Other factors were doors and windows, floor, and machinery. Samples indicated that there were more bacteria in the air near the outside walls than near the inside walls, and in the same manner more near the inside walls than in the center of the room.

The author concludes that bacterial contamination from the air was insignificant. The majority of the bacteria found were peptonizers and alkali-producing

and inert bacteria. A few weak acid-forming bacteria were found, but practically no strong acid-forming. Fewer molds than bacteria were present.

II. *A study of the amount of air taken into a freezer during the freezing of ice cream mix* (pp. 20–29).—In this work the freezer was made air-tight and an apparatus devised whereby the air entering the chamber could be measured. It was found that the amount of air that normally enters a freezer during operation is very small. It was found possible to make ice cream of normal overrun when all openings were made air-tight, and in a few cases where a partial vacuum was established in the freezer a normal overrun was obtained by lengthening the time of whipping somewhat. The author recommends that all openings of the freezer be kept closed during the freezing process for sanitary reasons.

Commercial casein, A. C. Weimar and J. Taylor (*Michigan Sta. Tech. Bul. 82 (1927), pp. 16*).—This work was planned to ascertain which of the commercial methods of manufacturing casein gave the best quality and greatest uniformity under ordinary conditions. The methods studied were the natural sour curd, hydrochloric acid, sulfuric acid, and rennet, each of which is described.

The natural sour method produced the most uniformly low ash casein and the yield was satisfactory. This method can not be used where the whey is saved for the recovery of milk sugar and albumin, and the time and vat space required do not favor the method for economic production. Rennet casein has some advantages, but its extremely high ash content limits its production since only small quantities of such casein are required by the trade. The sulfuric and hydrochloric acid caseins lend themselves to the greatest uniformity in manufacture. The former is the more economical when milk sugar is not manufactured, but the whey from this method can not be used for the manufacture of sugar.

VETERINARY MEDICINE

Manual of veterinary bacteriology, R. A. Kelser (*Baltimore: Williams & Wilkins Co., 1927, pp. XI+525, figs. 87*).—The several parts deal with the subject as follows: Bacteria, their morphology, physiology, and classification; bacteriological methods; infection and immunity; pathogenic organisms of the class Schizomycetes; pathogenic fungi; the Protozoa; the filtrable viruses; serology; hematology; preparation of veterinary biological products; and bacteriological examination of milk and water.

[Report of the department of veterinary science of the Indiana Station] (*Indiana Sta. Rpt. 1926, pp. 48–52, figs. 4*).—A study of the longevity of the hog cholera virus has shown that it survives but a short time in the body excretions and secretions and blood from a cholera hog. Pen infection (grass lots and inclosed pens) died out two days after removing the carcasses of cholera hogs. Practically all farm and community outbreaks of hog cholera are said to be traceable to shipments of livestock or hogs from public stockyards or sale pavilions.

A study made of the lesions of disease in pigs farrowed dead or that died when a few days old resulted in the finding of a degenerate liver, yellowish-red or yellow in color, friable, and easily ruptured, to be the principal lesion. The degenerative changes are mainly fatty in nature. Rupture of liver is common, and this together with the accompanying hemorrhage may be the immediate cause of the pig's death. Attempts to isolate the causative organism from the livers and to reproduce the disease by inoculation have been unsuccessful.

Observations of the occurrence of anemia in suckling pigs show it to be more frequently met with in pigs under five weeks of age and to be especially prevalent in farrowing seasons that are unusually cloudy. Brood sows that were

kept inside the hog house for a period of 14 months and raised two litters of pigs suffered no apparent injury.

It was demonstrated in work with field outbreaks of infectious abortion that it is possible to build up an abortion-free herd by practicing sanitary disease control measures. Brief reference is made to the production of hog cholera serum and antigen, to the testing of more than 250,000 hens in breeding flocks for bacillary white diarrhea, the testing of hog cholera serum and virus, and post-mortem examinations.

Annual report of the Imperial Institute of Veterinary Research, Muktesar, for the year ending 31st March, 1926, F. WARE (*Imp. Inst. Vet. Research, Muktesar [India], Ann. Rpt. 1925–26, pp. 18*).—A brief summary is given of the results of research work with infectious diseases of livestock, tabulated data on the results of inoculations in the field, etc.

On the relation of the alcohol-soluble constituents of bacteria to their spontaneous agglutination, P. B. WHITE (*Jour. Path. and Bact., 30 (1927), No. 1, pp. 113–132*).—In this paper the author deals with the action of alcohol in removing the salt-sensitiveness of rough variants, the precipitation of the alcohol-soluble substances with salt and other solutes, the influence of alcohol-extraction on serum agglutination, and agglutination with "any serum."

It was found that concentrated alcohol applied at a temperature between 50 and 60° C. removes the salt-sensitiveness of rough Salmonella variants without damaging the essential serological reactions of the bacillary bodies. Ether and chloroform are also effective, but acetone is not.

Quarter-evil and braxy: Studies regarding immunity, A. D. M'EWEN (*Jour. Compar. Path. and Ther., 39 (1926), No. 4, pp. 253–283*).—The author describes a new broth medium for the cultivation of *Bacillus chauvoei*, *Vibrion septique*, and other anaerobes that is free from tissue débris. *B. chauvoei* and *V. septique* grow luxuriantly in it without necessitating the use of an anaerobic jar, and large quantities of the organisms can be readily obtained. These cultures are suitable for the production of vaccines or suspensions for the agglutination test.

The agglutination test was applied to nine of the ten strains of *B. chauvoei* studied and showed that they all belong to a similar type. Nontoxic filtrates of cultures of *B. chauvoei* are capable of producing a considerable degree of immunity in inoculated animals, and filtrates from 24-hour cultures are as valuable as those from cultures aged up to 2 weeks. A vaccine containing the bacillary bodies of *B. chauvoei* sterilized by formalin proved most efficient in establishing immunity. Comparative tests with *B. chauvoei* formalinized vaccine and filtrate demonstrated the marked superiority of the former.

The application of the agglutination test to 16 strains of *V. septique* studied showed that the organisms belonged to different serological types. Ten of the strains belonged to one type, four to another, and the two remaining strains each to a type of its own. Immune sera were found to be precipitated by the toxins of homologous and heterologous types. Nontoxic filtrates of cultures of *V. septique* failed to immunize. Toxic filtrates when inoculated in relatively large amounts may produce a considerable degree of immunity. *V. septique* filtrates are comparatively of less value than *B. chauvoei* filtrates.

An immunity which is to a great extent, if not completely, independent of an exotoxin is readily established by the use of a vaccine containing the bacillary bodies of *V. septique* or their spores sterilized by the action of formalin. The advantages of this vaccine are the high degree of immunity produced, its complete safety, the smallness of the dose (0.5 to 1 cc.), and the fact that only one inoculation is necessary. The last is a factor of considerable importance in the treatment of large numbers of animals.

Comparative studies on vesicular stomatitis and foot-and-mouth disease, P. K. Olitsky, J. Traum, and H. W. Schoening (*Jour. Amer. Vet. Med. Assoc.*, *70* (*1926*), *No. 2*, *pp. 147–167*).—This is a report by the commission from the U. S. Department of Agriculture on studies of foot-and-mouth disease conducted at the Institute of Hygiene and Bacteriology at Strasbourg, France. Previous studies on the physical and chemical properties of foot-and-mouth disease virus by Olitzky and Boëz have been noted (E. S. R., 57, p. 470).

The authors have found that vesicular stomatitis is readily transferred to guinea pigs, and that there is little to differentiate this disease from foot-and-mouth disease by a study of the lesions induced. Cross-immunity tests in these animals, however, demonstrate that vesicular stomatitis virus can be distinguished readily and definitely from foot-and-mouth disease virus and offers an aid in the differentation of the two diseases. The vesicular stomatitis virus induces lesions in cattle which are at times indistinguishable from those of foot-and-mouth disease, but differences were noted in the response to various methods of inoculation of the two viruses. Divergence in the course of the two diseases was also observed. Immunity produced in cattle by vesicular stomatitis and foot-and-mouth disease is solid for its respective virus, but in the considerable number of cattle inoculated with, or exposed by contact to, the two viruses, no evidence of cross immunity was found. Swine were found to be susceptible to the acitve agent of vesicular stomatitis, the disease induced in them being indistinguishable from foot-and-mouth disease, but no evidence of cross immunity between the two was discovered. Horses were very sensitive to infection with vesicular stomatitis virus by inoculation on the tongue, but resistant to foot-and-mouth disease when inoculated on the tongue, mucous membrane of the lips, or intramuscularly. The horse can be regarded as the best test animal to differentiate vesicular stomatitis from foot-and-mouth disease.

In 13 of 18 carefully controlled filtration experiments, it was found that the virus of vesicular stomatitis was filtrable through Berkefeld V and N candles, through Seitz asbestos disks, and through Chamberland bougies, sizes L3 and L7. The virus, similar to that of foot-and-mouth disease, is not filtrable under ordinary conditions through Chamberland L11-type bougies and shows the same tendency to adsorption in the walls of denser electronegative filters.

The causal agent of vesicular stomatitis proved to be a filter-passing virus, W. E. Cotton (*Jour. Amer. Vet. Med. Assoc.*, *70* (*1926*), *No. 2*, *pp. 168–184*, *figs. 2*).—The author's investigation, here reported in detail, has shown that the virus of vesicular stomatitis will pass through the finest of the three grades, V, N, and W, of Berkefeld bacteria-retaining filters, in sufficient amounts to infect guinea pigs. Sufficient virus passes through the coarsest (V) and medium (N) grades of the above filters to infect horses, mules, and guinea pigs. Both the guinea pigs and larger animals which failed to show manifest lesions as a result of inoculation with the filtrates were in most cases rendered immune to a subsequent inoculation with proved virulent material. Horses as well as cattle may at times develop typical vesicular lesions in their feet, as a result of intravenous injections with vesicular stomatitis virus.

Earlier investigations of the disease by the author have been noted (E. S. R., 57, pp. 181, 182).

The relation between invasion of the digestive tract by paratyphoid bacilli and disease, T. Smith and H. A. M. Tibbetts (*Jour. Expt. Med.*, *45* (*1927*), *No. 2*, *pp. 337–352*).—The authors find that hog cholera bacilli fed to mice disappear from the stomach within 24 hours, but remain and perhaps multiply in the ileum for at least several weeks. They promptly penetrate the mucosa and may be found in the spleen. Bacilli introduced subcutaneously

quickly pass into the intestinal tract where they may be found for some weeks, and infected mice may harbor bacilli in the spleen for several months.

Paratyphoid infection of swine as the possible origin of paratyphoid infection of man [trans. title], M. MÜLLER (*Deut. Tierärztl. Wchnschr., 35 (1927), Nos. 2, pp. 20–23; 3, pp. 37–41; 4, pp. 53–57*).—An extended discussion of the subject reported in connection with references to the literature, a list of 57 of which is included.

Epizootic of rinderpest dealt with by local serum production in an outlying district of the Uganda Protectorate, U. F. RICHARDSON and J. CARMICHAEL (*Jour. Compar. Path. and Ther., 39 (1926), No. 4, pp. 311–317, figs. 2*).—The authors report that the cattle in the West Nile district were saved by the serum produced in that area, and describe the method of production.

A comparison of the pathogenicity for mice of the normal and rough forms of Salmonella enteritidis (Gärtner), A. N. GOYLE (*Jour. Path. and Bact., 29 (1926), No. 4, pp. 364–369*).—The author finds the normal or N form of *B. enteritidis* of Gaertner to be much more virulent for mice than the so-called rough or R form. The filtrate of the autolyzed culture of the normal form is also more toxic than that of the rough form. It is pointed out that heating to 100° C. reduces but does not destroy the toxicity of the filtrates of the normal form.

The tick transmission of tristeza and the immunity problem, II [trans. title], F. ROSENBUSCH and R. GONZALEZ (*Arch. Protistenk., 58 (1927), No. 2, pp. 300–320, figs. 2*).—This is a second contribution (E. S. R., 54, p. 276) from the Biological Institute of the Agricultural Society of Argentina. The authors find that pyroplasmosis is transmitted by the common cattle tick *Boophilus microplus* when the atmospheric temperature rises above 29° C. (84.2° F.) and anaplasmosis when the temperature rises above 34°.

The influence of dipping in solutions of arsenic upon the course of trypanosomiasis, E. W. BEVAN (*Jour. Compar. Path. and Ther., 39 (1926), No. 4, pp. 284–292*).—The experiments here reported indicate that the dipping of guinea pigs infected with trypanosomiasis in arsenic-containing solutions of certain strength and at certain intervals brings about the disappearance of trypanosomes from the peripheral blood. The parasite is not eliminated, since when dipping is discontinued it again reappears after a longer or shorter interval, and the disease thereafter runs its usual course. The results obtained appear to depend upon (1) the strength of the arsenic in the solution and (2) the frequency of the immersion.

A rapid method for performing the agglutination test in the serum diagnosis of Bang's abortion disease in cattle, I. F. HUDDLESON and E. R. CARLSON (*Jour. Amer. Vet. Med. Assoc., 70 (1926), No. 2, pp. 229–233, fig. 1*).—In this contribution from the Michigan Experiment Station, the authors, after referring to the precipitation work of Kahn[1] and others, describe a rapid method of performing the agglutination test which they have perfected. A highly sensitive antigen was developed, the procedure for the preparation of which and for performing the test is described. The rapid and the slow methods were compared on 2,000 samples of bovine serum, the results obtained being identical in 100 per cent of the cases where clumping was complete or incomplete in 0.04 cc. or less of serum. The authors are convinced that this rapid method is as accurate as the present slow-agglutination method for the serum diagnosis of Bang's abortion disease in cattle. The rapidity with which the results may be returned to cattle owners, especially when animals are shipped interstate, makes its use highly desirable and to be preferred to the slower method. The authors

[1] Serum Diagnosis of Syphilis by Precipitation, R. L. Kahn. Baltimore: Williams & Wilkins Co., 1925, pp. XII+283, pls. 6, fig. 1.

have also employed this method in the serum diagnosis of undulant fever in man in a number of cases, the results in every case having confirmed those of the slow-agglutination method.

Incidence of mastitis and the infecting organisms in four dairy herds, J. G. Hardenbergh and C. F. Schlotthauer (*Jour. Infect. Diseases, 40 (1927), No. 6, pp. 667–672*).—A study of 68 cases of mastitis indicates the prevalence of streptococci as infecting agents of the disease, although other organisms, particularly staphylococci and members of the colon-typhoid group, may show occasional periods of predominance. It is pointed out that the veterinarian seldom sees cases of bovine mastitis not complicated by infection. It is believed that the incidence of the more severe cases of mastitis can be materially reduced in all herds by adherence to a few simple rules of dairy hygiene, such as the isolation of mastitis cases, avoidance of disseminating the infection from infected cases, prevention of dietary disorders, and precautions against traumatism.

Contribution to the diagnosis and treatment of affections of the uterus of the cow, H. Tavernier (*Contribution au Diagnostic et au Traitement des Affections de l'Utérus de la Vache. Paris: Libr. le François, 1926, pp. 55*).—The first chapter (pp. 9–19) of this work deals with the classification of affections of the uterus, their diagnosis and prognosis, and chapter 2 (pp. 20–51) with treatment.

Vibrios from calves and their serological relation to vibrio fetus, T. Smith and M. L. Orcutt (*Jour. Expt. Med., 45 (1927), No. 2, pp. 391–397*).—The calf vibrios thus far studied include one strain serologically distinct from the fetal strains. The others are closely related to the fetal strains, though not identical with them. The pathogenic characters of the calf vibrios, either as possible descendants of *Vibrio fetus* or as independent factors in the production of enteritis, have not been demonstrated.

Comparative pathology of South African jagziekte and Montana progressive pneumonia of sheep, E. V. Cowdry and H. Marsh (*Jour. Expt. Med., 45 (1927), No. 4, pp. 571–585*).—The authors' investigations of progressive pneumonia in Montana have led to the conclusion that it is extremely doubtful whether it is possible to distinguish between it and jagziekte, known since 1893 to occur in South Africa. In localities in which they occur each is recognized as an infection quite distinct and apart from other better-known pneumonias. Predisposing factors which lead to bacterial invasion are presumably of great importance in both. The authors state that they have no precise information regarding the organisms concerned, but that in both diseases the initial changes are alike and occur in the interalveolar tissue, and the subsequent proliferations of epithelium and the pneumonia are of the same character and apparently follow in exactly the same sequence. Finally, in both diseases, there is much fibrosis and the animals inevitably die through depletion of respiratory area and pneumonia.

Male fern in liver rot of sheep, R. F. Montgomerie (*Jour. Compar. Path. and Ther., 39 (1926), No. 4, pp. 293–301*).—In comparative tests made of four commercial brands of liquid extract of male fern, their toxicity and therapeutic efficiency in the treatment of liver rot of sheep varied but little.

Diseases of swine, K. Glässer (*Die Krankheiten des Schweines. Hanover: M. & H. Schaper, 1927, 3. ed., [rev. and enl.], pp. VII+501, pl. 1, figs. 126*).—This is a third edition, revised and enlarged, of the work previously noted (E. S. R., 32, p. 83.)

Atlas of equine anatomy, IV, R. Schmaltz (*Atlas der Anatomie des Pferdes. Berlin: Richard Schoetz, 1927, pt. 4, pp. [9], pls. 39*).—This, the fourth part of the work previously noted (E. S. R., 32, p. 584), deals with the anatomy of the viscera.

Report of the poultry disease diagnostic laboratory at Farmingdale, Long Island, J. M. HENDRICKSON (*N. Y. State Vet. Col. Rpt. 1925–26, pp. 54–60*).—This report deals briefly with the occurrence and nature of bacillary white diarrhea, parasites, roup and chicken pox, infectious bronchitis, fowl typhoid, and diseases in ducks.

The differentiation of Bact. pullorum (Rettger) and Bact. sanguinarium (Moore), J. M. HENDRICKSON (*N. Y. State Vet. Col. Rpt. 1925–26, pp. 146–172; abs. in Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 5, pp. 629–644*).—This is a report upon investigations, the details of which are given in tabular form. The data presented have led the author to the following conclusions:

B. pullorum, alpha type, may be differentiated from *B. pullorum*, beta type, on the basis of gas formation provided a suitable nutrient basic medium is used for the tests. As has been pointed out by Hadley et al. (E. S. R., 40, p. 831), ordinary extract broth is not a suitable medium for this purpose. Contrary to the findings of Hadley et al. (E. S. R., 40, p. 685) and Goldberg (E. S. R., 38, p. 180), certain strains of pullorum which were aerogenic when freshly isolated have lost their power of gas formation after varying periods of artificial cultivation.

By the agglutination and agglutinin-absorption tests it is not possible to differentiate the two types of *B. pullorum* from each other or from *B. sanguinarium*. By fermentation tests it is possible to make such a differentiation between the strains studied when infusion or extract media are used as the substrate for the carbohydrates, but when serum water is used as the basic medium the characteristic fermentative differences disappear. All of the sanguinarium strains grew much better on ordinary media than the pullorum strains. Therefore, the thought is suggested that ordinary broth is not a very favorable medium for fermentation tests with *B. pullorum*, and if such is the case, differences in fermentative results in this medium should not be accepted as demonstrating a specific taxonomic difference between this organism and another for which the medium was better suited.

This work shows that there are but few cultural differences between *B. pullorum* and *B. sanguinarium*. In fact, aside from somewhat greater growth vigor on the part of the latter, no characteristic cultural differences were found. The author is not prepared to state as yet that these organisms are one and the same species, but at least this work has lent strength to the suggestion of Hadley et al. (E. S. R., 40, p. 685) that *B. pullorum* may be *B. sanguinarium* in the making.

Observations on B. pullorum infection of cock birds, T. M. DOYLE (*Vet. Jour., 83 (1927), No. 624, pp. 305–309*).—The author first calls attention to the fact that the degree of reaction to the agglutination test in cock birds is less marked than in hens. Marked fluctuations in the agglutination titers of carrier hens are also observed when tested at frequent intervals over a long period, but this is of little practical importance as the titers very rarely fall below 1:25, the dilution used in the laboratory of the British Ministry of Agriculture. Regarding the reliability of the test the author states that when properly carried out and correctly interpreted the percentage of error is small and does not diminish to any appreciable extent its practical value.

In infected cocks fluctuations in titer are of great importance, and if not taken into consideration may make all the difference between a negative and a positive reaction. The statement that in the majority of cocks the titer is about 1:25, it being exceptional to find one as high as 1:50, is substantiated by tabulated data. Three successive agglutination tests were made of 13 reacting cocks with intervals of 21 and 30 to 35 days, respectively, followed by post-mortem examinations. While the titers were below 1:25 in 6 of the 13, never-

theless, *Bacterium pullorum* was recovered from one or other of the internal organs. In one case it was isolated from the testes of a bird that was a nonreactor at the time of the examination, but which had given a positive reaction a month earlier.

The results obtained have led the author to consider it advisable when testing cock birds to accept a positive reaction in a dilution of 1:15 as indicating infection. Since positive reactions in low dilutions may be due either to a temporary drop in the agglutinin content of the blood or to gradual elimination as a sequel to the birds' having overcome infection, a second test, after an interval of one month, is considered necessary to ascertain which of the two factors is involved before finally rejecting the bird for breeding purposes.

In the first transmission experiment conducted, 2 cocks with agglutination titers of 1:25 and 1:50, respectively, were kept in a pen with 6 pullets over a period of 130 days, during which period 160 eggs were laid, 90 of which were examined by the cultural method and 60 were artificially incubated. From 1 egg, laid about the twenty-first day, *B. pullorum* was isolated by the cultural method, but due to an oversight no examination was made of the organs of the hen which laid the egg and the results are considered inconclusive.

In an experiment undertaken with a view to determining whether transmission to the cock bird takes place through contact with infected hens, 2 healthy cocks were placed with 17 naturally infected carrier hens. Agglutination tests of the cocks made monthly for a period of 9 months gave uniformly negative results, as did bacteriological examinations of the internal organs at the end of this period. In repetition of this experiment, a healthy cock kept with infected hens for 7 months and another for 5 months also failed to become infected. The author concludes that adult cock birds do not readily contract the disease from contact with infected hens. In post-mortem examinations made of the 13 naturally infected cock birds, *B. pullorum* was isolated from the testes of 6, spleens of 3, gall-bladder wall of 1, and heart muscle of 1.

Bacillary white diarrhea, E. L. BRUNETT (*N. Y. State Vet. Col. Rpt. 1925–26, pp. 131–145, figs. 8*).—This is a practical summary of information on bacillary white diarrhea.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Indiana Station] (*Indiana Sta. Rpt. 1926, pp. 17–20, figs. 2*).—Soil erosion studies have shown that a grade of 0.6 ft. per 100 ft. is a maximum for Paoli soil. Improvement of moisture content with greater seepage of water into the hillsides promises to be an important secondary result of terracing.

Temperature tests of poultry houses showed that in unheated houses the average winter temperatures remain from 1 to 3° F. above the outside temperature, with a lag of about an hour. However, when the outside temperature dropped suddenly to zero or lower, the inside temperature averaged from 3 to 15° higher. The use of brooder stoves reduced the variation in inside temperature approximately 10°, and in extremely cold weather maintained a temperature 20° higher than the outside temperature. The relative humidity varied rather uniformly in inverse ratio to the temperature. When the curtains were down in partially open front houses, the air changed once a minute or oftener depending on the wind. Atmospheric conditions outside the house caused the ventilators to function with great irregularity, sometimes reversing the direction of air movement, and thus demonstrating the ineffectiveness of poultry house ventilators as commonly designed for partially open front houses.

In an experiment on dairy feed grinding, in which definite grades of fineness were established for grain crushed or cracked, medium ground, and pulverized,

both the power and labor requirements were more than seven times as great for pulverized corn sufficiently fine for all of it to pass through a No. 14 screen as for cracking it so that a No. 4 screen was required.

In studies of the artificial cooling of apple storages it was found that the cost, including ice and electric fan operation for 1,200 bu. of apples, was 24.4 cts. per bushel for a period of two months. The temperature ranged from 12 to 15° higher in the uniced room during the warm period but was not appreciably higher thereafter, and even ran lower during the last two weeks on account of lack of ventilation in the iced room during the prevailing cold nights. Grimes and Jonathan apples kept in the iced room remained in salable condition about one month longer than similar fruit kept in the uniced room.

Data are also briefly reported on the generation of electricity by windmills, on tests of an experimental rotary soil tiller, and on rural electrification.

Report of the State irrigation commissioner, G. S. Knapp (*Kans. State Irrig. Commr. [Bien.] Rpt. 1925–26, pp. 58, pl. 1, figs. 4*).—The work of the office of the State irrigation commissioner of Kansas for the biennium from July 1, 1924, to June 30, 1926, is described in this report. It includes a review of the activities of the department, a statement of the general provisions of the proposed Arkansas River compact, a brief on the law of interstate compacts, and the results of stream flow measurements.

[Irrigation experiments at the Umatilla Field Station, Hermiston, Oreg.], H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 422 (1927), pp. 12–15*).—The results of border irrigation experiments with different lengths and widths of borders are briefly reported, which indicate in general that with heads of 3 or more second-feet of water on hand not having excessive slopes borders from 30 to 40 ft. wide and from 150 to 200 ft. long are the best sizes for sandy soils. Where water is expensive or scarce, yields below 0.75 ton of alfalfa per acre-foot of water are not considered profitable.

Lysimeter investigations with medium sand, fine sand, coarse sand, silt and silt loam, cropped and uncropped, showed that the highest rate of percolation was from the lysimeter containing medium sand without a crop. For an 11-year period 70 per cent of the irrigation water applied was lost by deep percolation. The soy bean crop on medium sand did not use as much water as alfalfa on medium sand. The use of manure on medium sand reduced the percolation. The percolation was lower from fine sand than from medium sand and that from coarse sand was higher than that from any of the others growing alfalfa.

Concrete cradles for large pipe conduits, W. J. Schlick and J. W. Johnson (*Iowa Engin. Expt. Sta. Bul. 80 (1926), pp. 43, figs. 18*).—Studies are reported which show that the supporting strength of pipe before cracking may be increased from 50 to 100 per cent by the use of properly designed cradles. The percentage of increase with a particular cradle will vary with the quality of the pipe and is higher for the weaker and lower for the stronger pipe. The use of a cradle which has a thickness under the pipe of one-fourth the nominal diameter of the pipe and which extends up the sides to a height of one-fourth the outside diameter of the pipe should increase the supporting strength about 75 per cent. Decreasing the proportional thickness of the cradle under the pipe and its height at the sides each reduced the effectiveness of the cradle. It is considered doubtful if it will be economically advisable to use reinforcing in a cradle with a thickness less than one-fourth the diameter under the pipe and a height at the sides of less than one-half the diameter for small pipe or one-third the diameter for large pipe. Reinforcing appears to be of value only in that portion of the cradle under the pipe, as none of the cradles tested developed a visible fracture or crack except under the pipe. Properly designed

and constructed reinforced cradles of these dimensions should increase the cracking strength of the pipe from 75 to 100 per cent. Because of the lack of opportunity to develop side support as the pipe deformed after cracking, the ultimate loads sustained by cradled pipe in the tests were considered as measures of only the minimum ultimates which similarly cradled pipe would develop in actual installations. It is concluded that if the effectiveness of cradles for reinforced concrete pipe are to be based upon the supporting strength of the pipe before developing a crack of a specified surface width, consideration should be given to the higher supporting strength of the pipe itself at this cracking load and to the side support that may be developed through the deformation of the pipe and the cradle. This side support may be material in the case of pipe in trenches in firm sod.

Mechanical properties of Dutch East Indian timbers, L. G. DEN BERGER (*Dept. Landb. Nijv. en Handel Nederland. Indië, Meded. Proefsta. Boschw., No. 12 (1926), pp. VIII+63, figs. 2*).—The results of a large number of tests of the mechanical properties of Dutch East Indian timbers are tabulated and briefly discussed. The results indicate that a relation exists between most of these properties and the specific gravity, an increasing specific gravity being in general accompanied by higher values with a few exceptions.

The movement of moisture with reference to timber seasoning, S. T. C. STILLWELL (*[Gt. Brit.] Dept. Sci. and Indus. Research, Forest Prod. Research, Tech. Paper 1 (1926), pp. IV+29, figs. 10*).—Studies are reported the purpose of which was to ascertain what actually occurs in timber during the process of evaporation in so far as moisture movements are concerned, and the results are presented in terms of rather complex mathematical expressions. There is nothing in the results which is directly antagonistic to the idea of a dual flow of the general form of flow equation.

Primary stresses in timber roofs, with special reference to curved bracing members, A. J. S. PIPPARD and W. H. GLANVILLE (*[Gt. Brit.] Dept. Sci. and Indus. Research, Bldg. Research, Tech. Paper 2 (1926), pp. IV+32, pl. 1, figs. 11*).—A theoretical analysis of intricate timber roofs is presented and the method applied to a simple hammer beam roof, a timber roof with steel ties, and a small arched hammer beam roof.

Public Roads, [June–July, 1927] (*U. S. Dept. Agr., Public Roads, 8 (1927), Nos. 4, pp. 61–88+[2], figs. 26; 5, pp. 89–104+[2], figs. 3*).—These numbers of this periodical contain the status of Federal-aid highway construction as of May 31 and June 30, 1927, respectively, together with the articles following:

No. 4.—Digest of Report of Ohio Highway Transportation Survey, by J. G. McKay; and Analysis of Concrete Arches, Part I, Derivation of Formulas and Analysis of Symmetrical Arches, by W. P. Linton and C. D. Geisler.

No. 5.—The First International Soil Congress and Its Message to the Highway Engineer, by C. Terzaghi; Analysis of Concrete Arches, Part II, Analysis of Unsymmetrical Arches, by W. P. Linton and C. D. Geisler; and Comparison of Truck and Railroad Tonnage Between Columbus and Selected Ohio Cities.

Alcohol motor fuels consisting of acetylene dissolved in alcohol or in acetone-alcohol, M. RINDL (*So. African Jour. Sci., 23 (1926), pp. 268–272, fig. 1*).—Studies conducted at Grey University College, Bloemfontein, are reported, from which the conclusion is drawn that an alcohol-acetone-acetylene motor fuel or any fuel containing dissolved acetylene is not likely to be a commercial success, since it deteriorates rapidly and its calorific value is practically the same as that of the solvent. There is also more danger of explosions and fires than in the case of gasoline.

Engine service tests of internal-combustion engine lubricating oils made from California crude petroleum, M. J. GAVIN and G. WADE (*U. S. Dept. Com., Bur. Mines, Tech. Paper 387 (1926), pp. V+57, pls. 3, figs. 6*).—Tests of Class A medium grade and Class C medium grade oils are reported and discussed. The oils of high alkali absorption numbers seemed to lubricate as effectively as those of low alkali absorption numbers.

Nebraska tractor tests, 1920–1926, rules for official tractor testing, and the Nebraska tractor law (*Nebraska Sta. Bul. 220 (1927), pp. 38*).—This bulletin summarizes all of the reports of the Nebraska official tractor tests, conducted since this work began in 1920 under the provisions of the Nebraska tractor law on 130 different models and types of tractors. During the first four seasons of testing there were several tractors the claims of which had to be revised before they could complete the test. During the last three years, however, every tractor tested was able to go through the test and to meet all the original claims made for it.

A general improvement in operation and design was noted in all the later tractors. Practically all now employ air cleaners and inclosed gears as a protection against the effects of dust, and also give evidence of considerable attention to simplification of design and to improved ease of operation and servicing.

An inexpensive drawbar dynamometer, E. C. SAUVE (*Agr. Engin., 8 (1927), No. 6, pp. 145–147, figs. 5*).—An inexpensive drawbar dynamometer developed at the Michigan Experiment Station is described and diagrammatically illustrated and the theory of its operation analyzed.

Manufacture and sale of farm equipment, 1925 (*Washington: U. S. Bur. of the Census, 1927, pp. II+13*).—Statistical data on the production and sale of farm equipment in the United States during 1925 are presented in tabular form. The total value of farm equipment manufactured in 1925 showed an increase of 21.4 per cent over the 1924 production and of 7.6 per cent over the 1923 production. Increases were shown for 1925 for 9 of the 11 groups of equipment, the exceptions being harvesting machinery and haying machinery, which showed decreases of 4.6 and 2 per cent, respectively, from the previous year.

Construction of self-feeders and their use in pork production, W. E. CARROL and W. A. FOSTER (*Illinois Sta. Circ. 319 (1927), pp. 23, figs. 27*).—Data on the planning and construction of self-feeders for hogs are presented, together with working drawings and bills of material. Information on their use is also briefly presented.

Theoretical considerations of thermal characteristics of dairy equipment sterilizers, A. W. FARRALL (*Agr. Engin., 8 (1927), No. 6, pp. 143, 144, fig. 1*).—This is the first of a series of papers on the subject of the development of dairy equipment from the California Experiment Station. It presents a theoretical analysis of the thermal characteristics of dairy sterilizers.

Trench silo, R. C. MILLER and I. COURTICE (*N. Dak. Agr. Col. Ext. Circ. 7[illegible] (1927), pp. 32, figs. 32*).—Practical information on the planning and construction of trench silos for use under North Dakota conditions is presented, together with working drawings and bills of material.

The Connecticut 12 x 12 brooder house, R. E. JONES (*Conn. Agr. Col. Ext. Bul. 110 (1927), pp. 6, figs. 6*).—Practical information on the planning of brooder house for Connecticut conditions is given, together with working drawings and bills of material for its construction.

A portable brooder house, C. W. CARRICK and L. D. MAYER (*Purdue Agr. Ext. Bul. 148 (1927), pp. 8, figs. 7*).—Practical information on the planning of portable brooder house is presented, together with working drawings for [illegible]

RURAL ECONOMICS AND SOCIOLOGY

Diminishing returns in agriculture, F. L. PATTON (*New York: Columbia Univ. Press, 1926, pp. 100, figs. 4*).—The objects of this essay are "to discover what light can be shed by the results of certain agricultural experiments on the problem of securing a more precise formulation of the conventional law of diminishing returns as applied to experimental agriculture . . . to discover the factors responsible for the logically demonstrable rise and fall of returns in agricultural enterprise [and] to show, by means of the presentation of some statistics of the past history of agricultural productivity and some arguments in refutation of certain views as to its future, the apparent lack of foundation for the belief in a temporal process of diminishing returns in agriculture." The data presented are divided into three groups, physical, experimental, or technical diminishing returns; entrepreneurial or money returns; and secular returns.

The tests for determining the existence of diminishing returns are discussed and applied to simple cases of physical returns, illustrations being taken from experimental data of different experiment stations and experimenters on returns in the sources of farm power for agricultural operations, in the application of fertilizers, seed and cultivation of the soil, and in food transformation by farm animals.

The factors affecting profits as a whole are considered. Overhead and fixed costs are separated from physical input and illustrated by experimental data. The curves of average money returns and profits were found to be anticlinal, the crest of the former, however, being reached with the smaller input. The author concludes that the common statement of the law of diminishing returns in agriculture is applicable to agricultural enterprise, and the returns referred to must be average, or else not returns, but profits.

Data are presented to show that in the past secular increasing returns have been the rule. The author contends that the arguments that secular diminishing returns will occur in the future possess weaknesses, and that "it seems reasonable to expect a continuance of secular increasing returns." The main conclusion of the essay is that there is no one law of diminishing returns, but there must be at least three groups of statements, one each for the phenomena of physical, entrepreneurial, and secular returns.

The share of agriculture in the national income, H. C. TAYLOR and J. PERLMAN (*Jour. Land and Pub. Utility Econ., 3 (1927), No. 2, pp. 145–162, figs. 4*).—The purpose of this article is to show the share of the total national income received by agriculture in each year from 1909 to 1925. Prices are studied, the value of farm products analyzed, and the expenses calculated and net income of agriculture computed for comparison with the total "current income" of the people of the United States.

Tables and charts are given and interpreted showing by months from January, 1910, to January, 1927, the index numbers of the prices of agricultural and nonagricultural products and the purchasing power of farm products; by years the value from 1909 to 1925 of farm products in terms of 1913 dollars, the net income of agriculture for 1909–1926, the purchasing power of net income for 1909–1925, the percentage of total current income of the people of the United States received by agriculture for 1909–1925, and the number of all bankruptcies and farm bankruptcies for 1910–1925; and by geographic divisions the number of farms per 1,000 changing ownership by various methods during the year ended March 15, 1926.

The percentages received by agriculture of the total current income varied from 20.2 to 21.9 during the period 1909–1916, were 23.6, 23.9, 20.8, and 14.2,

respectively, in the years 1917–1920, and varied from 10.7 in 1921 to 10.2 in 1925. The percentages of farm bankruptcies and of all bankruptcies rose very gradually from 4.8 in 1911 to 7.5 in 1917, were 7, 6.3, 6.4, and 9, respectively, in the years 1918–1921, then rose rapidly to 18.7 in 1924, and declined to 17.8 in 1925.

Maladjustment of price ratios of agricultural and nonagricultural commodities, due to the unbalanced economic life of the Nation and the artificial price influences brought about by legislation and organization, is pointed out as the central feature of the after-war depression in American agriculture.

[Investigations in agricultural economics at the Indiana Station] (*Indiana Sta. Rpt. 1926, pp. 9–12, 29–32, figs. 2*).—Results of investigations in agricultural economics not previously noted are reported as follows:

Livestock marketing.—Too heavy loading of cars and failure to make provision for temperature changes were found to be the causes of many losses experienced in shipping hogs.

Marketing dairy products.—Data from 106 farms near Lebanon and 260 in southern Indiana showed that the better dairy practices were followed on farms with large herds. The chief problems in disposing of dairy products were found to be inefficient practices and great seasonal variation in the production of milk, excessive duplication in transportation and selling agencies, wide variation in prices at buying centers, and a marked shortage of high-quality products.

Agricultural adjustments in northern Indiana.—The value of manufactured products, the number of wage earners, and the amount of wages paid in seven northern Indiana cities increased 725 per cent, 300 per cent, and 1,170 per cent, respectively, from 1899 to 1923. Rural population in Lake, La Porte, Elkhart, and St. Joseph Counties decreased from 1900 to 1920, while urban population increased over 180 per cent. Wages for farm labor were higher in these industrial regions than in other sections of the State. Efficiency of farm labor in the 14 northern counties increased from 1900 to 1920, so that a laborer used 117 per cent more machinery, and cared for 23 per cent more improved land, 29 per cent more dairy cows, and 58 per cent more poultry.

Farm tenancy and farm ownership.—Data from records of 117 farms near Brook for seven years, 1919 to 1925, showed that farms operated under a two-thirds profit share plan with a manager supervising a number of farms were promoting ownership, and that farms under such a plan made more than twice the interest rate on the investment and the operators saved $812 yearly as compared with $126 for the average Indiana tenant. Size of business justifying employment of competent managers and securing of lower costs in production and marketing, capital available at lower rates of interest, and business and social cooperation between landowners, managers, and tenants were the most important factors in bringing about greater profits and savings.

A preliminary study of 127 New Mexico ranches in 1925, A. L. Walker and J. L. Lantow (*New Mexico Sta. Bul. 159 (1927), pp. 107, figs. 23*).—The results are given of a study completed during the spring of 1926, in cooperation with the Bureaus of Agricultural Economics and Animal Industry, U. S. D. A., to determine the importance of different factors in range cattle production and the relative efficiency of the practices in beef cattle and sheep production in New Mexico. The data were gathered by the general survey method, the ranchmen being interviewed by an enumerator. The report is based on records from 112 strictly cattle ranches, 4 steer ranches, 8 cattle and sheep ranches, 1 registered herd, and 2 sheep ranches in the northeastern, western, and southwestern parts of the State.

A brief history is given of the cattle industry, the three districts studied are described, and the use of land, water development, rate of stocking, cost of

fencing, death losses, and other factors dependent upon ranch location are analyzed. The problems of land utilization, range and cattle management, taxes, credit, markets and marketing, and cost of producing calves are discussed. The data from the 112 strictly cattle ranches were divided into four groups—ranches with less than 301 breeding cows, with from 301 to 500 breeding cows, 501 to 1,000 breeding cows, and over 1,000 breeding cows—and analyzed.

The 112 strictly cattle ranches averaged 26,720 acres of private lands, of which 23.01 per cent was owned and the remainder leased, and 10,237 acres of public domain, being a total of 30.2 acres per animal unit. The total investment was $74,637 per ranch and $60.97 per animal unit, of which 48.54 pr cent was in lands and 47.07 per cent in cattle. The average indebtedness was $27,552 per ranch and $22.51 per animal unit, of which 50.96 per cent was on land and improvements and 46.07 per cent on cattle. The ranches averaged 1,180 cattle, of which 778 were breeding cows. The average number of cattle handled per man was 383, the average death loss 17 per cent, the percentage of calf crop branded 47, and the cost of producing calves $30.80. The average receipts per animal unit were $15.17 and the returns $9.41. The percentage of return on total investment was 15.44 and that based on average valuations 0.02.

The analysis of the ranches grouped according to the number of breeding cows showed the 301 to 500 group to be the most profitable, the percentage of return based on average valuations being 4.85, as compared with 0.95, 1.59, and —2.12, respectively, for the other groups according to size. The 301 to 500 breeding cow group averaged 581 head of cattle, 19,944 acres per ranch, and 32.7 acres per animal unit, of which 5,796 acres were public domain and 80.56 per cent of the other lands was leased. The investment was $66.53 and the total indebtedness $25.54 per animal unit. The percentage of breeding cows was 60, the average loss per 100 head 12, and the number of cattle handled per man 264. The return on total investment was 18.07 per cent, as compared with 13.75, 15.69, and 15.16 per cent, respectively, for the other groups.

The average return on investment for the 8 cattle and sheep ranches was 8.98 per cent.

Range sheep production on the Red Desert and adjoining areas, A. F. Vass and H. Pearson (*Wyoming Sta. Bul. 156* (*1927*), *pp. 87, pl. 1, figs. 27*).—This bulletin presents the results of a study of the systems of management, cost of production, and returns on investment during the calendar year 1925 on 65 of the largest and most representative sheep ranches in the Red Desert and adjoining areas of southwestern Wyoming. The data were collected from the operators by field men using an especially prepared record sheet. The financial records and systems of management of the several ranches were analyzed, and a study was made of the influence of weather, land settlement, taxation, credit, marketing problems, and the postwar deflation in the region.

The average size of the ranches studied was 14,694 acres, of which 515 acres were irrigated for hay and pasture. The average investment per ranch was $131,726, of which 37.2 per cent was in land, buildings, and improvements, and 53.48 per cent in sheep. Of the average investment 20.8 per cent was borrowed capital. There were on an average 6,538 sheep units per ranch. Receipts from sheep and wool constituted 90.52 per cent, and the increase in inventory of sheep 6.3 per cent, of the total receipts. The profits ranged from —20 to 22 per cent on the investment. The average return, after allowing 8 per cent on capital and $2,507 for operator's labor, was 5.4 per cent, being $1.10 per ewe. The rate of turnover of the capital invested in sheep averaged 70.8 per cent. The cost of production in 1925 was $8.71 per sheep unit and $8.84 per ewe. The various items in cost of production are discussed.

The chief factors influencing returns on investment are discussed. Some of the conclusions follow: With the present system of using leased lands, open ranges, and National forests, 50 to 70 per cent of the total investment should be in sheep. With all land owned, 85 to 90 per cent of the total investment should be in land and sheep, the amount being equally divided between the two. With the present high assessment of land, averaging \$2.84 per acre on the 65 ranches, the owning of land is not profitable. It is assumed that an assessed valuation of 39 cts. per acre would permit operators to own winter range. The correlation coefficient of return on investment compared with the percentage of investment in sheep was found to be $+0.486\pm0.063$. Ranches with 4,000 to 9,000 breeding ewes appear to give the best returns. The correlation coefficient of return on investment compared with the number of sheep handled per man was $+0.433\pm0.068$. It was found that the number of sheep handled per man should be 650 to 1,000, and that with less than 550 there was a very poor chance of a favorable return. The relation of rate of return to the lamb crop was found to be $+0.348\pm0.074$, but the number of sheep handled per man seemed to have little effect on the percentage of the lamb crop, the correlation coefficient being $+0.130\pm0.082$. A multiple correlation of return on investment with the combined weight of the percentage of investment in sheep, the number of sheep handled per man, and the percentage of lamb crop gave a coefficient of $+0.638$.

Marketing and management on the range are discussed. A spread of from 1 to 2 cts. per pound between feeder and fat lambs was found necessary under present conditions for the average lamb feeder to operate.

Apricots, H. R. Wellman (*California Sta. Bul. 425 (1927), pp. 42, figs. 22*).—Tables and graphs are presented showing for periods of years (1) for the State the acreage of trees bearing and nonbearing, the commercial production, the amounts dried and canned, and the interstate shipments of fresh fruit; (2) the acreage of trees, bearing and nonbearing, by counties; (3) the acreage and number of trees in the United States, and the exports of dried and canned apricots from the United States; and (4) the prices, relative prices as compared with the average for 1910–1914, and the relative purchasing power of California apricots.

Economics of producing and marketing South Carolina peaches, W. C. Jensen (*South Carolina Sta. Bul. 238 (1927), pp. 51, figs. 12*).—This bulletin reports the results of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics of the production practices and marketing conditions as related to peach growing in the McBee and Greenville sections of South Carolina.

The costs of developing an acre of peaches to three years of age, including interest and cost of land, were found to average \$128.10 in the McBee section and \$260.01 in the Greenville section. The farms in the McBee section averaged 395.1 acres, with 116.8 acres in crops, of which 32.3 acres were in peaches. In the Greenville section the farms averaged 72.2 acres, with 51 acres cropped, of which 31.4 acres were in peaches. Based on 1925 records the cost of production, including interest, was found to be 58 cts. per bushel at the orchard unpacked and 91 cts. per bushel f. o. b. local station in the McBee section, and 78 cts. per bushel at the orchard unpacked in the Greenville section. The average yield per acre in the McBee section was estimated at about 140 bu. with two crop failures during a profitable bearing life of 12 years. In the Greenville section the average yield was estimated to be about 155 bu. per acre with three crop failures in a profitable bearing life of 15 years. A study of the data from six typical farms in 1925 showed the net returns per bushel to have varied from −1 ct. to 68 cts

The marketing practices of the two sections and the chief markets for, and the competition to be met by, South Carolina peaches are discussed. It is pointed out that the present indications are that the peach production of the Greenville section will increase approximately 100 per cent in the next three years and that of the entire State about 60 per cent, and that competition with other States will increase. Economy in production, securing large yields and high quality, and efficiency in grading, packing, and selling are deemed necessary to meet these conditions successfully.

Strawberry production and marketing in Arkansas, C. O. BRANNEN and J. A. DICKEY (*Arkansas Sta. Bul. 218 (1927), pp. 27, figs. 6*).—The results are given of a study of the present status of the strawberry industry in the State, the present markets, the competition of other sections, marketing practices, and the cost of bringing strawberies to bearing age and producing and marketing a crop.

The cost of bringing an acre of strawberries to bearing, based on 1926 cost rates and including interest and cost of land, was found to vary from $106.79 to $112.61 in the different areas of the State. The cost per quart in the field, including interest, was 5.9 cts. in the northwestern counties and 6.5 cts. in the southwestern counties and in White County. The cost f. o. b. local station was 1.6 cts. per quart higher in each section. Average receipts per acre above cost in 1926 were $109 in the northwestern counties, $119 in the southwestern counties, and $127 in White County.

The future of the industry and the probable adjustments necessary are discussed briefly.

The farming business in Idaho (*Idaho Sta. Bul. 151 (1927), pp. 125, figs. 37*).—This is part 1 of a tentative report of the agricultural situation in Idaho, based on an economic survey of the production and marketing of farm products of the State and prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics. The topography, climate, soils, land values, tenure, agricultural credit, cooperative agencies, and other general factors influencing the agricultural development of the State are discussed. Tables, graphs, and maps with interpretative text are given covering, for periods of varying length, the utilization of the agricultural lands of the State, and the acreages, production and value of, prices for, gross and net returns from, markets for, and other data regarding wheat, sugar beets, beans, peas, alfalfa and clover seed, feed and forage crops, fruit and vegetables, swine, beef cattle, sheep, horses, etc., for the State. General data for the United States are also included for the various enterprises.

Basic facts about Montana's agriculture (*Mont. Agr. Col. Ext. Bul. 81 (1926), pp. 87, pl. 1, figs. 91*).—Tables, maps, and graphs are included presenting basic facts as to the physical basis of agriculture and the evolution of agriculture in Montana, crop distribution, and each of the more important agricultural commodities of the State.

An agricultural program for Montana, J. C. TAYLOR, M. L. WILSON, ET AL., edited by J. DEXTER (*Mont. Agr. Col. Ext. [Bul.], 84 (1927), pp. 38, figs. 15*).—This bulletin contains the recommendations of the district committees on land utilization, grain and forage crops, livestock, dairying, poultry, and horticulture composed of representative men and women in the six districts into which the State was divided, and the general conclusions applicable to the entire State based upon the recommendations of the district committees.

An agricultural production, consumption, and marketing study in the Greenville, South Carolina, trade area, F. H. ROBINSON and W. C. JENSEN (*South Carolina Sta. Bul. 240 (1927), pp. 88, figs. 11*).—This bulletin reports the results of a study made to develop a progressive and efficient farming

program for the area. The report is based upon farm organization data for Anderson County, covering a number of years and collected from 153 to 333 farms each year; upon from 10 to 60 records on each of the special enterprises; and upon interviews with 250 housekeepers of Greenville and surrounding mill towns to determine their preferences in buying farm produce. Records of freight and express, manufacturing and distributing plants, representative samples of movements-in of produce by farmers and hucksters, and sales at the city curb markets were also secured.

Analyses are made for cotton, truck crops, fruit crops, feed crops, meats, poultry, and dairy products, showing the local production, consumer demand, net imports, and local cost of production. The possibilities for improvements in and extension and combination of enterprises are discussed.

An appendix contains tables showing per capita consumption, sources, net imports by rail and seasonal distribution thereof, the cost of producing one acre of various crops, and the itemized physical quantity requirements and costs per cow in wholesaling and retailing milk in the Greenville area.

Development and present scope of land economics, G. S. WEHRWEIN (*Jour. Land and Pub. Utility Econ., 3 (1927), No. 2, pp. 203–206*).—A brief outline of the development of instruction and research in land economics at the University of Wisconsin and Northwestern University.

Farm lease systems in Michigan, F. T. RIDDELL (*Michigan Sta. Circ. 102 (1927), pp. 18, fig. 1*).—A popular circular setting forth the types of farm leases used in the State, and matters to be considered by tenants and landlords in drafting leases. A suggestive outline for a 50–50 livestock lease contract is included.

Co-operative credit in Finland, V. HYVÖNEN (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 4 (1926), No. 4, pp. 500–516*).—The organization and functioning of the Central Institute of Cooperative Credit Banks, Ltd., founded in 1902, and the local cooperative credit banks, which have increased from 10 in 8 communes in 1903 to 1,233 in 423 communes in 1925, are described and discussed.

The development of cooperative credit in Finland has followed the general course of the cooperative movement in that country, i. e., the formation of a central organization and then under its auspices and with its support the foundation and development of local cooperative bodies.

Agricultural credit in Poland, W. BOBOWSKI (*Internatl. Rev. Agr. Econ. [Rome], n. ser., 4 (1926), No. 4, pp. 449–499*).—The various agricultural credit institutions, their organization, field of operation, and functions in different parts of Poland during the period of the partition of that country and since the World War in independent Poland are described and discussed.

Land rent and the prices of commodities, H. G. HAYES (*Amer. Econ. Rev., 17 (1927), No. 2, pp. 219–229*).—The thesis of this paper is that the position of Jevons that land rent is a causal factor in the pricing of commodities is correct. From a study of the changes in the acreage of wheat, corn, hay, oats, cotton, barley, rye, and potatoes in the United States in 1921–1924, and the yield per acre and price of corn from 1909 to 1924, inclusive, the author concludes that the margin of transference from one crop to another rather than the extensive and the intensive no-rent margins is the price-making force, and that the prevailing land rent is an important element in the making of choices at the margin of transference.

Ohio farm incomes for 1926, C. R. ARNOLD (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 130, 131*).—An analysis of 257 farm records for 1926 showed the average labor income to be $1,389, and that only 16 farms showed no net income. Records kept on 72 farms showed the cash receipts and labor income in 1926 to have increased $765 and $418, respectively, over 1925.

Cost of feeding the Nebraska farm family, J. O. Rankin (*Nebraska Sta. Bul. 219 (1927), pp. 36, figs. 5*).—The results are given of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics of the costs and standards of food consumption of 114 farm owners, 60 part owners, 160 tenants, and 8 hired men in 4 areas typical of conditions in different parts of Nebraska. The average household, including hired help, visitors, and more permanent residents, consisted of 2.17 adults and 2.22 children, the average size varying from 3.97 persons for owner families to 5.11 persons for part owner families.

The money value of food consumed, including home-raised food at its selling price, averaged $734 per household, being $685 for owners, $880 for part owners, $728 for tenants, and $596 for hired men. The percentage by money value of food produced at home for all households was 68.9, being 70 per cent for owners, 70.1 for part owners, 68.6 for tenants, and 41 per cent for hired men. Of the total value of food consumed for all households, the percentages for different foods were meat 24, eggs 7.7, milk 22.6, butter and cheese 10.4, flour 4.3, other cereal products 3.4, potatoes 3.4, other root crops 0.5, other vegetables 4.7, fruits 7.8, fats and sweets 9, and other food 2.2. The percentages home produced were meat 82.7, eggs 99.9, milk 99.9, butter and cheese 87.1, flour 13.9, potatoes 87.4, other root crops 82.2, other vegetables 69.4, fruits 31.4, and other foods 3.3.

The following average quantities per adult equivalent per year were used: Meat 295.1 lbs., of which about one-half was pork, one-fifth beef, and from one-fifth to one-third poultry; eggs 57.3 doz.; whole milk 252.7 qt.; cream 45.9 qt.; skim milk and buttermilk 37.1 qt.; butter 45.9 lbs.; margarines 1 lb.; cheese 7.3 lbs.; flour and corn meal 226.8 lbs.; bread, crackers, and other cereal products purchased 62.5 lbs.; potatoes 430.7 lbs.; other root crops 37.3 lbs.; fresh vegetables 166 lbs.; dried and canned vegetables 16.9 qt.; fresh fruits 258.5 lbs.; dried and canned fruits 25.5 lbs.; fats purchased 6.6 lbs.; sugar 90.8 lbs.; sirup 13.9 lbs.; and coffee 12.6 lbs. Of the groceries, animal products, fruits, and vegetables, 96.7, 8.8, 68.6, and 30.7 per cent, respectively, were purchased.

Tables are given showing the amounts of different kinds of food consumed, purchased, and produced at home by each class of family. Comparisons are made with other States and with urban families.

Adjusting hog production to market demand, F. F. Elliott (*Illinois Sta. Bul. 293 (1927), pp. 501–567, figs. 18*).—This bulletin, prepared in cooperation with the U. S. D. A. Bureau of Agricultural Economics, includes a discussion of why hog prices fluctuate, based largely on the statistical analysis of hog prices in U. S. D. A. Bulletin 1440, previously noted (E. S. R., 56, p. 184); the results of statistical studies of the causes of the fluctuations in the supply of hogs and of the response of hog producers in different sections of Illinois to the corn-hog ratio; and a discussion of the practices of the majority of farmers, what certain successful farmers are doing to adjust their hog production to market demand, and of the possibilities of smoothing out the hog-price cycle.

Tables and graphs are included showing the net effect of (1) different December (time of breeding) corn-hog ratios on receipts of hogs at Chicago 9 to 15 months later, (2) different average corn-hog ratios for June to November (6 months preceding the breeding period) on receipts 12 to 18 months later, (3) different average corn-hog ratios for January to March (3 months following the breeding period) on receipts 6 to 12 months later, (4) the three combined corn-hog ratios on receipts 6 to 18 months later, and (5) the combined corn-hog ratios upon production in the grain, livestock, wheat, and dairy sections of Illinois. A graph is also included showing the effect of climatic conditions at farrowing time upon receipts at Chicago 6 to 12 months later.

The statistical anlysis showed that 72.1 per cent of the variation in receipts of hogs at Chicago from 1898 to 1916 can be accounted for by the three corn-hog ratios lagged for the periods noted above. *Climatic conditions at farrowing time accounted for 18 per cent of the variation.* The December hog-steer ratio, changes in percentage of nonmerchantable corn in Illinois and Iowa from the previous years, disease losses, and the estimated number of breeding sows on farms were found to be of minor importance as factors affecting receipts at Chicago.

A statistical appendix describes the method of analysis used.

Crops and Markets, [July, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), No. 7, pp. 233–280, figs. 6*).—The usual tables, charts, and summaries are given. Special articles are included on the pig survey, June 1; the hog supply and demand situation and the price outlook for 1927 and 1928; and the income from agricultural production showing, among other things, (1) the gross value of farm production for 1925 and 1926 by products and by States, (2) by years (1919–20 to 1926–27) the gross value of farm production, the gross income by groups of commodities, net income, rates of return on capital invested in agriculture, the reward per farm family for labor, and the distribution of gross income from agricultural production, and (3) by geographic divisions the size of farms, value of farm property, receipts by items, and cash outlay by items of 13,475 farmers reporting for 1926, and the percentages of such farmers having net incomes or losses of various amounts, together with comparisons for 1922 to 1925, inclusive.

Work of the Umatilla Field Station in 1923, 1924, and 1925, H. K. Dean (*U. S. Dept. Agr., Dept. Circ. 422 (1927), pp. 1, 2, 4, 5*).—Parts of this report discuss the conditions on the Umatilla reclamation project near Hermiston, Oreg., and give the acreages and yields of the principal crops, 1914–1925; the number of livestock, 1923–1925; and the number of farms, number of dairy cattle and hogs per farm, and the acreage of alfalfa per head of dairy cattle, 1914–1925.

[Yearbook statistics of crops, livestock production, trade, and meteorology] (*U. S. Dept. Agr. Yearbook 1926, pp. 801–1271*).—Current statistics and summaries are given for grains, fruits and vegetables, field crops other than grain, farm animals and animal products, and foreign trade in agricultural products, as noted for the previous year (E. S. R., 55, p. 787). Miscellaneous statistics on crop acreage, production, and values, returns from farming, cost of production, prices, farm labor and wages, farm population, farm equipment, farmers' business organizations, freight tonnage and rates, fertilizers, highways, value of goods used and purchased by farmers, etc., and meteorological data as to temperature and precipitation are also included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Public school dormitories for rural children in Montana, J. E. Richardson and J. W. Barger (*Montana Sta. Bul. 201 (1927), pp. 68, figs. 11*).—This bulletin presents information regarding existing public-school dormitories in Montana, secured principally by personal visits to the dormitories and surrounding communities. The reasons for establishing, history of growth, experiences, and the general factors responsible for success, the effects of dormitory life upon pupils, and the attitude of parents and school officials toward such dormitories were studied. A series of suggestions for planning, equipping, furnishing and managing public-school dormitories is included, with menus, cost data time schedules, etc.

A forest fire prevention handbook for the schools of Arizona (*U. S. Dept. Agr., Misc. Circ. 88 (1926), pp. 18, figs. 13*).—This circular, prepared by the Forest Service in cooperation with the superintendent of public instruction of Arizona, includes lessons on the forests of Arizona, forest fires and their causes, effects, and prevention, and how fires are discovered and put out.

FOODS—HUMAN NUTRITION

A rational basis for the standardization of the experimental baking test, M. J. Blish (*Cereal Chem., 4 (1927), No. 2, pp. 149–155*).—In this further discussion of the problem of standardizing the experimental baking test (E. S. R., 56, p. 86), a distinction is made between two types of procedure. In the first or variable type an attempt is made to bake a flour according to its own special requirements and the value of the flour is judged by comparing the finished loaf with an arbitrary standard. In the second or fixed type, "all flours, regardless of source, type, variety, grade, or previous history, are handled in precisely the same manner, with the same proportions and amounts of added ingredients, and are subjected to the same environmental conditions, especially degree and uniformity of temperatures, which are carefully regulated and controlled, not merely approximated." In the opinion of the author the second or fixed type of procedure should be tentatively adopted for testing the baking quality of flour.

Whole wheat bread vs. white bread (*Indiana Sta. Rpt. 1926, p. 41*).—It is noted briefly that experiments conducted on white rats to demonstrate the relative value of whole wheat and patent flour breads in respect to isolated factors such as protein, minerals, and water-soluble growth-promoting vitamin have shown the whole wheat bread to be superior to the white bread in these factors. "The difference in the nutritive value of the two breads is not to be taken too seriously, inasmuch as in the ordinary dietary of man enough other substances are included to adequately supplement these deficiencies."

A contribution to the chemistry of the edible domestic birds, J. S. Hepburn and A. B. Katz (*Jour. Franklin Inst., 203 (1927), No. 6, pp. 835–841*).—Data are reported on the proximate composition of duck and goose eggs, including the white, yolk, and whole egg; the abdominal adipose connective tissues of the turkey and goose; and on the constants of the visceral fat of the turkey and the goose, the subcutaneous fat of the goose, and the egg yolk fat of the goose and duck.

Diet, light, and the biological value of milk [trans. title], L. Randoin and H. Simonnet (*Bul. Soc. Sci. Hyg. Aliment., 14 (1926), No. 5, pp. 217–243, figs. 10*).—A review of studies relating to the content of vitamins A, B, C, and D in milk as affected by the feed of the cow, and in the case of D by light.

Lactic acid milk as a routine infant food, J. A. Stephen and E. R. C. Walker (*Lancet [London], 1927, II, No. 2, pp. 63–65, fig. 1*).—A brief report of favorable results obtained in the use of lactic acid milk feeding in a group of 50 babies over an average period of 8.8 weeks, together with a discussion of the principles involved in the use of lactic acid milk as advocated by Marriott and Davidson (E. S. R., 51, p. 167) and directions for preparing whole lactic acid milk and various modifications.

Commercial Bacillus acidophilus and Bacillus bulgaricus cultures and preparations, L. H. James (*Jour. Amer. Med. Assoc., 89 (1927), No. 2, pp. 89–92*).—This contribution from the Bureau of Chemistry, U. S. D. A., consists of the report of an examination for bacterial count and identification of organisms of 107 samples of commercial preparations advertised to be cultures of

B. acidophilus or *B. bulgaricus*. Of these, 34 were broth and 28 milk cultures, and 34 tablet, 3 powder, and 8 semisolid preparations.

Of the entire number of samples examined, 18 produced the species claimed on the label in reasonably pure form and satisfactory numbers, 15 were sufficiently pure and contained viable organisms in sufficient number to have possible value, and the others were worthless. The milk cultures had the highest average counts, the whey cultures next to the highest, and the solid cultures the lowest. Contaminating organisms were more common in solid than in broth or milk cultures. "There is need of revision of the present methods of marketing acidophilus and bulgaricus cultures and preparations and of adequate, scientific supervision of the purity and viability of such products."

Bacteria prevalent in sweetcorn canning, L. H. James (*Jour. Bact., 13 (1927), No. 6, pp. 409–417*).—This paper reports the isolation and identification of the microorganisms obtained from freshly gathered sweet corn, corn as it passes through the cannery, corn packed in a barrel and allowed to heat, corn piled in the cannery bins overnight, and corn remaining in the farmer's wagon overnight.

Sixty-six strains were isolated, representing 18 types. The largest group, comprising 33 strains, contained an organism of the *Bacillus subtilis* group which was present on fresh corn at every stage in the process of canning and unaffected by preheating to 185° F. Four of the 18 types belonged to the *B. subtilis* group, and of the remaining, 1 resembled *B. mesentericus*, another *B. cereus*, a third *B. agri*, a fourth *B. cohaernes*, and a fifth *Aerobacter aerogenes*; 2 others were similar to the Achromobacter, 2 to Flavobacterium, and 5 were not identified.

"Thermal death point determinations of 57 strains which produced spores revealed only 6 which would withstand in the 10 tubes tested a temperature of 240° maintained for 15 seconds. Comparison of the thermal death points determinated at 250, 245, and 240° with the curves of heat penetration into corn when processed at those temperatures made it apparent that none of the organisms obtained would withstand the cooks recommended to the commercial canner. Thus corn handled with care and dispatch and, when canned, given the full process recommended, would not contain highly resistant thermophiles."

Studies in canning (*Indiana Sta. Rpt. 1926, p. 32*).—Observations on the rise of temperature inside cans of tomatoes processed in the household steamer (compartment type) have indicated that, although the periods usually given for processing are sufficient when only one or two cans are used, from 7 to 10 minutes should be added when the steamer is filled to its maximum capacity with quart cans.

The calcium oxide content of some Philippine foods, F. T. Adriano and E. J. Tavanlar (*Philippine Agr., 14 (1925), No. 6, pp. 347–357*).—Analyses for moisture, total ash, and calcium oxide are reported of a number of native Philippine foods, including fish, fruits, meat products, milk and other dairy products, seeds, tubers and bulbs, and vegetables. The materials for the most part were secured from local vendors, and the analyses were made by the Official method on duplicate samples of the edible portions.

Iron in the diet of normal children, M. S. Rose (*Amer. Jour. Pub. Health, 17 (1927), No. 1, pp. 89–91*).—This is a brief report of the study of the influence of prolonged administration of egg upon the hemoglobin content of children's blood. About 40 children in a nursery school conducted under the auspices of the Institute of Child Welfare Research of Teachers College, Columbia University, were divided into two groups as closely matched as to age and other conditions as possible, and with the same diet except that each child in one group received an egg daily in addition. At the end of two years the group having

the eggs showed no significant differences in height and weight gains, but the children were in better physical condition and showed an improvement in hemoglobin and red cell count over those not receiving the egg. Cod-liver oil was administered to a few of the children without effect upon the blood. An examination of the children's diet having shown an abundance of vitamins A and B, but a possible deficiency of vitamin C, a tablespoonful of orange juice was also given daily for six months to half of the children in each group, but without any appreciable effect.

In an experiment of shorter duration, four months, 10 of the children who had been on the no-egg diet for a year or more were given three times a week 1 oz. of calf's liver which furnished the same amount of iron per week as did the daily egg. The hemoglobin showed a distinct rise within a month, continuing for two months, and then falling to a lower level. It is suggested that the iron in the egg is efficiently utilized, but with no special stimulation of the blood-forming organs, while the liver exerts a special stimulating effect. It is concluded that eggs form a very valuable reenforcement for the diet of the young child even when the diet is not lacking in any known dietary essential.

Protein requirement as determined in diabetic children, W. M. Bartlett (*Amer. Jour. Diseases Children, 32 (1926), No. 5, pp. 641–654, figs. 8*).—Nitrogen metabolism studies on 6 diabetic children from 4 to 14 years of age, 4 of whom were treated without insulin and 2 with insulin, are reported, with the conclusion that from 0.6 to 1.0 gm. of protein per kilogram of body weight is sufficient to maintain a positive nitrogen balance, with normal growth, gain in weight, and development, provided the diet is adequate in calories and rich in vitamins. The protein requirement was found to vary inversely with the calorie intake and with age, to have no relationship to fatty acid-glucose ratio provided ketosis is absent, and to be directly proportional to the rate of growth.

The effect of various supplementary lunches on the plasma carbon dioxide capacity of children, A. F. Morgan and G. D. Hatfield (*Amer. Jour. Diseases Children, 32 (1926), No. 5, pp. 655–666*).—During the course of the investigation previously noted (E. S. R., 56, p. 698) of the effect of supplementary feeding of oranges, figs, or milk to undernourished children, determinations were made of the carbon dioxide-combining capacity of 12 of the children, five of whom were from 5 to 17 per cent underweight, one 33 per cent overweight, and six practically normal in weight by the Baldwin-Wood standards.

The six normal weight children had alkaline reserve figures of from 42 to 65 per cent (cubic centimeters of carbon dioxide per 100 cc. of plasma), 4 of the 5 underweight children had values of from 38 to 51, and 1 child receiving pulled figs as supplementary lunch made more than three times the expected gain in weight and showed an increase of 5.5 per cent in carbon dioxide-combining power of the plasma at the end of 43 days. Five children receiving oranges showed increases in carbon dioxide-combining power of from 1.7 to 11.19, the lowest gains being for the 2 subjects who failed to gain in weight. Two of the 3 children who were changed from oranges to milk after a 28-day interval showed a decrease in alkaline reserve of 8 and 7.78 per cent. The third showed an increase of 1.37 per cent after a 43-day interval on milk.

Nutrition class experiments with school children, A. M. Field and M. A. Stennis (*Nation's Health, 9 (1927), No. 6, pp. 17, 18*).—A comparison of the weight gains of 20 children during a comparatively short period of nutrition instruction, with supplementary meals, and succeeding periods of from 3 to 6 months or more in which no instruction was given, indicated, as was brought out in the report of Kaiser, Norton, and Walker (E. S. R., 55, p. 789), that with no continuing program of health instruction and practice the marked gains made during the period of nutrition classes are not maintained after

the close of the nutrition work. "A definitely planned system of follow-up involving nutritionist, public health nurse, and public school teacher undoubtedly could have conserved much that was lost. Obviously, it is unsafe to evaluate nutrition class work for short periods without a later investigation of results."

Formulas of different types of diets and methods of preparation of foods employed in nutrition experiments on the rat [trans. title], H. C. CANNON (*Bul. Soc. Sci. Hyg. Aliment.*, *14* (*1926*), *No. 7*, *pp. 339–365*, *figs. 9*).—A description of the composition and preparation of the various diets which have been used in the nutrition studies at the Connecticut State Experiment Station under the direction of Osborne and Mendel. A bibliography of studies reported from their laboratory is appended.

Vitamin studies in Porto Rico, D. H. COOK (*Porto Rico Health Rev.*, *2* (*1927*), *No. 11*, *pp. 22*, *23*).—Two native Porto Rican foods, the plátano, or plantain (*Musa paralaciaco*), and the yautia, a starchy root belonging to the same family as the taro and dasheen, have been tested for vitamin A and vitamin B by the methods described by Sherman (E. S. R., 55, p. 691).

About 2.6 gm. per day of white yautias and only 0.2 gm. of yellow yautias were required to bring about the standard gain of 3 gm. per week for 8 weeks in the vitamin A experiments. The plátanos were even richer in vitamin A than the yellow yautias, only 0.09 gm. daily being required.

In the vitamin B experiments the amounts required for maintenance for the 8-week period were 1.7 gm. daily of white yautias, 0.9 gm. of yellow yautias, and 3.4 gm. of plátanos. In comparison with other materials which have been tested by the same methods, the plátanos are considered to be equal to tomatoes, green peas, and yellow sweet potatoes as a source of vitamin A, and to carrots, white potatoes, and turnips as a source of vitamin B. Yellow yautias, which ranked first of the three materials tested in vitamin B potency, are said to have about the same value as spinach and canned navy beans as a source of vitamin B.

On the quantity of anti-scorbutic vitamin in some citrus species and in bananas, B. C. P. JANSEN and W. F. DONATH (*Meded. Dienst Volksgezondh. Nederland. Indië*, *1925*, *No. 3*, *pp. 225–239*).—Various citrus fruits native to India and imported were tested for their content of vitamin C by feeding experiments on guinea pigs, using a basal diet of unpolished rice 320, skim milk powder 80, cod-liver oil 1, and salt mixture 8 parts.

A sweet orange from Surinam and a sour orange from Brazil, *Citrus vulgaris*, were extremely low in their content of vitamin C, from 8 to 10 cc. daily being required as a protective dose. Of the Indian species, a sweet orange resembling European tangerines, *C. nobilis*, was quite rich in vitamin C, protection being secured with 2.5 cc. daily. The shaddock, *C. decumana*, was nearly as effective, but a small sour lemon, *C. lemonellus*, was very low in vitamin C, 5 cc. being insufficient as a protective dose. Samples of two citrus juices used on Government and pilgrim steamers as a protection against scurvy were found on analysis to contain very little genuine juice and an extremely low content of vitamin C.

Two varieties of Indian bananas afforded protection in amounts of 10 gm. daily.

Colour tests for vitamin A: Their application to naturally occurring products, S. G. WILLIMOTT and F. WOKES (*Lancet* [*London*], *1927*, *II*, *No. 1*, *pp. 8–11*).—The literature on color tests for vitamin A is reviewed briefly, and a summary is given of the results obtained in attempts to apply several of the tests to cod-liver oil, foodstuffs, and various natural products from which interfering pigments have been removed by shaking the material in petroleum

ether solution with an adsorbent charcoal, preferably norit. Tables are given of the results obtained with concentrated sulfuric acid, phosphorus pentoxide, arsenic trichloride, and antimony trichloride color tests, together with an estimation of the activity of the materials tested by rat feeding experiments.

Of the color reagents, arsenic trichloride and antimony trichloride proved most satisfactory. It was found that vitamin D apparently does not interfere with the test nor give a color reaction. Olive oil and oleic acid interfered with the test, and their use as diluents of cod-liver oil in the color tests is discouraged. Natural pigments in cod-liver oil could not be removed completely by treatment with the charcoal. Decolorized orange rind oil gave a strongly positive test, as well as showing marked activity in animal feeding tests. Another very potent material, as judged by both color and feeding tests, was decolorized spinach extract. Positive results were also obtained with decolorized extracts of carrots and yellow corn.

It is concluded that the successful application of color tests for vitamin A to pharmaceutical materials and foodstuffs requires the careful observation of a number of precautions, but it is urged that the tests be tried on as many natural products as possible in order to establish definitely the specificity of the tests.

Nutritional value and standardization of cod liver oil and of its nonsaponifiable fat-soluble vitamine concentrate (Oscodal), H. E. DUBIN (*Jour. Amer. Pharm. Assoc., 16 (1927), No. 1, pp. 41–45*).—A general discussion of the standardization, potency, and advantages over cod-liver oil of the concentrate Oscodal, the preparation of which has been described previously (E. S. R., 53, p. 765).

The motility of the intestinal tract in experimental beriberi (rats) and scurvy (guinea pigs), B. A. PLUMMER (*Amer. Jour. Physiol., 80 (1927), No. 2, pp. 278–287*).—Additional evidence of decreased intestinal motility in extreme vitamin B deficiency, as previously noted by Gross (E. S. R., 51, p. 463), has been obtained by comparing isolated segments of the intestines of normal and vitamin B-deficient rats in rate and amplitude of rhythmic contraction, tonus, and duration or the length of time in which the excised strips exhibit spontaneous contractions in oxygenated Locke's solution. The tests were made on rats which had been for about seven weeks on the deficient diet and had developed a spastic gait characteristic of this deficiency. The length of time during which spontaneous contractions took place was markedly decreased by the absence of vitamin B, as were the rate and amplitude of the contraction, especially in the duodenal and ileal segments and the tone of the musculature. In similar experiments with scorbutic guinea pigs, there was also a decrease in the duration of spontaneous activity of the strips and in the number of rythmic contractions, except in the ileum where the reverse was true. There was an increase instead of a decrease in the amplitude of the rhythmic contractions, and the tonus of the intestinal wall was considerably increased.

A study of the alimentary tract in experimental scurvy (guinea pig), E. A. SMITH (*Amer. Jour. Physiol., 80 (1927), No. 2, pp. 288–300, figs. 5*).—In this investigation of the motor function of the gastrointestinal tract of the guinea pig when fed a diet deficient in vitamin C, both acute and chronic scurvy was produced in the guinea pigs under examination—the acute form by a basal diet of wheat flour and alfalfa meal made into a paste with water, together with whole oats and water ad libitum, and the chronic form by the same basal diet with the addition of 0.5 cc. of orange juice daily. On the basal diet alone the animals died from scurvy in from 10 to 30 days. Those receiving a small addition of orange juice developed chronic paralysis or incipient scurvy and lived for from 6 to 8 months. Each experimental group consisted of 4 ani-

mals on the basal diet alone, 4 on the chronic scurvy diet, and 4 on the complete diet (basal diet plus 3 cc. of orange juice daily). No observations were made when the animals were moribund.

The first part of the investigation consisted of X-ray studies of the emptying time of the stomach after a barium meal. A total of 170 observations on 44 guinea pigs showed no delay in the emptying time of the stomach as the result of the scorbutic condition. Control experiments on fasting animals showed a decrease in the emptying time of the stomach during the early days of fasting. Instances reported of decreased emptying time in scurvy are attributed to scurvy hunger.

The rate of movement through the entire gastrointestinal tract was studied by methods similar to those of Gross (E. S. R., 51, p. 463), except that a dye (iron oxide) was used instead of charcoal to mark the feces. In 121 tests on normal and 100 on scorbutic guinea pigs, no significant differences in the rate of passage of food along the gastrointestinal tract were noted. These results, together with the observations of Plummer noted above, are considered to indicate quite definitely that there is no impairment of the gastrointestinal tract in scurvy.

A few observations are also reported on the intestinal permeability. No differences were noted in the amounts of albumoses necessary to produce alimentary albuminuria in scorbutic and normal animals, in the amount of glucose necessary to produce alimentary glycosuria, and in the amount of xylose recoverable in the urine after xylose feeding.

An apparatus for automatically timing and separating excreta in metabolism studies is described and illustrated.

Antirachitic properties of irradiated dry milk, G. C. Supplee and O. D. Dow (*Amer. Jour. Diseases Children, 34 (1927), No. 3, pp. 364–371, figs. 4*).—In addition to data similar to those previously reported (E. S. R., 57, p. 491) on a comparison of the specific antirachitic effect of nonirradiated and irradiated dry milk, data are reported on the comparative value of these milks as a source of vitamin A for rats and vitamin C for guinea pigs.

Contrary to results previously reported in the literature, there was no impairment of growth on the irradiated milk such as would be the case if the irradiation had brought about a destruction of vitamin A. On the other hand, growth was slightly better with the irradiated than the nonirradiated milk, and this was attributed to the increased antirachitic properties of the milk. In curative tests similar results were obtained with the irradiated and nonirradiated milk. In the vitamin C tests, 80 cc. of reconstituted irradiated or nonirradiated milk fed to guinea pigs as the sole source of vitamin C completely protected the animals from scurvy.

"The favorable results obtained with dry milk irradiated with ultra-violet rays, from the standpoint of laboratory studies, indicate that nutritive and therapeutic properties of the product are enhanced to an appreciable degree. It appears that the beneficial results known to accrue to food products exposed to ultra-violet rays can be attained without measurable destruction of the readily oxidizable vitamins A and C, provided that a suitable technique of irradiation is used. Critical studies of the product under consideration have shown that there is no evidence of a disagreeable flavor and odor commonly found in milk products that are exposed to the ultra-violet rays for long periods of time. Furthermore, the usual keeping qualities of the product are apparently unimpaired. The irradiated product has been found to keep satisfactorily and apparently in its original condition for a period of several

months. The comparative studies which have been made indicate that the process of activation as applied does not accelerate oxidation of the fatty constituents to a degree that impairs the nutritive value or in any way induces changes of a detrimental character."

Therapeutic studies with irradiated ergosterol [trans. title], P. GYÖRGY (*Klin. Wchnschr., 6 (1927), No. 13, pp. 580–584*).—Data are presented showing that irradiated ergosterol is capable of curing rickets in rats when fed in doses of 0.005 mg. daily and in infants in doses of from 1 to 8 mg. daily. Case reports are given for 25 children from 2.5 to 14 months of age, all of whom responded readily to treatment with ergosterol, with prompt increase in the percentage of calcium and phosphorus in the blood. In one case there was marked improvement following the administration of irradiated ergosterol in amounts of only 1 mg. daily.

Ergosterol and its action in infantile rickets [trans. title], H. BRUMER and C. FALKENHEIM (*Klin. Wchnschr., 6 (1927), No. 17, pp. 798, 799*).—Further evidence is given of the curative action of irradiated ergosterol in infantile rickets. Six children from 3.5 months to 2 years of age were treated with irradiated ergosterol, dissolved in rape oil or triolein, in doses of from 2 to 3 mg. daily. Healing, both as judged by changes in the blood calcium and phosphorus and by X-ray examination, was evidenced as early as 10 days in two cases, and was rapid in all but one case.

Heliotherapy and actinotherapy in relation to pediatrics, F. W. SCHLUTZ (*Amer. Jour. Diseases Children, 32 (1926), No. 6, pp. 900–921; 33 (1927), No. 1, pp. 122–135*).—A review of the literature on sources of ultra-violet rays, the physiological action of light on the blood metabolism and pigmentation, and heliotherapy in tuberculosis and rickets. A list of literature references is given at the end of each section.

Iodization of public water supplies for prevention of endemic goiter, R. OLESEN (*Pub. Health Rpts. [U. S.], 42 (1927), No. 20, pp. 1355–1367, fig. 1; also in Jour. Amer. Waterworks Assoc., 18 (1927), No. 2, pp. 193–207*).—In this discussion of the advantages and disadvantages of iodizing water supplies to prevent endemic goiter as has been done in Rochester, N. Y., since 1923, the distinction is first made between prophylaxis and treatment, with emphasis on the fact that the amount of iodine added to the water is insufficient for the treatment of existing goiter, though probably sufficient for prevention. It is thought that the amount of iodine present in properly treated water is so minute that no harm could possibly result from excessive consumption of the water. Estimated costs of iodizing water in several large cities in goitrous districts are given, showing a range of from 1 ct. per capita per year at Rochester to 3 cts. at Sault Ste. Marie, Mich. Thus far sufficient evidence has not been obtained as to the ability of the iodized water so to reduce the incidence of endemic goiter as to make it advisable to recommend the measure for widespread adoption. A plea is made for more precise experimental work, with careful and repeated thyroid examinations both of children and adults, in localities where iodized water is used with control experiments in nearby communities among groups which are not consuming iodized water. An extensive list of literature references is appended.

Limitations of goiter prophylaxis (*Jour. Amer. Med. Assoc., 89 (1927), No. 2, pp. 114, 115*).—A review and discussion of recent literature on the subject, including the above paper by Olesen and previous ones by Olesen and Taylor (E. S. R., 57, p. 296) and McClendon (E. S. R., 57, p. 297).

TEXTILES AND CLOTHING

The influence of ultra-violet rays on the strength properties of fiber materials [trans. title], P. Heermann and H. Sommer (*Leipzig. Monatschr. Textil Indus., 40 (1925), No. 6, pp. 207–212, figs. 7*).—According to additional data (E. S. R., 54 p. 394), mineral weighted silk is most sensitive to light, followed in order by raw silk, jute, raw and bleached cotton, raw wool, mercerized cotton, nitro- and viscose rayons, chrome wool, bleached flax yarn, and the most resistant cuprammonium rayon and raw flax yarn. "Monopol black" dye appeared to render silk highly resistant, and its use is suggested for balloon and airplane fabrics.

Ultra-violet transmission of celanese (*U. S. Dept. Com., Bur. Standards Tech. News Bul. 124 (1927), p. 9*).—Qualitative tests by the radiometry section of the U. S. Bureau of Standards showed that uncolored cloth of satin weave transmits but little ultra-violet light of wave lengths less than 303 μ, whereas the blue colored voile weave readily transmits these rays. Folding the voile weave cloth so that the light had to pass through four layers of the material greatly reduced the transmission, practically all the "vitalizing" rays being absorbed. The closeness of the weave evidently determines the amount of ultra-violet transmission. Wetting the satin weave did not appreciably increase the transmission.

The elastic properties of flax yarns, J. A. Matthew (*Jour. Textile Inst., 13 (1922), No. 2, pp. 45–54, figs. 6; 18 (1927), No. 6, pp. T207–T242, figs. 8*).—Part 1 of this paper describes a testing machine designed for determining the elasticity of flax yarns and gives a general, largely qualitative, account of various features of load-stretch diagrams from flax, hemp, and cotton yarns. Part 2 presents the quantitative investigation of these diagrams, especially in the case of flax yarns.

The mathematical relation of yarn strength to staple length and yarn count, A. N. Sheldon (*Textile World, 72 (1927), No. 3, pp. 46–48, figs. 5*).—Charts drawn up from data obtained in spinning tests with cotton by the U. S. Department of Agriculture show the approximate strength of carded and combed cotton warp yarns of various staples.

Technological reports on standard Indian cottons, 1923–26, A. J. Turner (*Indian Cent. Cotton Com. [Bombay] Bul. 7 (1927), pp. [4]+95, figs. 20*).—This is a revised edition of an earlier report (E. S. R., 55, p. 392), giving data for the 1925–26 cottons as well as for the 1923–24 and 1924–25 cottons previously given.

Deterioration of cotton during damp storage, A. C. Burns (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 71 (1927), pp. VI+92, pls. 13*).—A review of factors involved in the deterioration of cotton during damp storage and of spinning tests by the U. S. Department of Agriculture is supplemented by experiments largely reported from another source (E. S. R., 54, p. 234). The literature cited is grouped under deterioration and microscopy of the cotton fiber; cellulose-decomposing bacteria and fungi; and moisture in, storage of, and spinning tests with cotton.

Identification of the vat dyes on cotton [trans. title], M. Vajs (*Melliand Textilber., 8 (1927), No. 7, pp. 611–619; trans. in Textile Recorder, 45 (1927), No. 533, pp. 59–67*).—An extensive list of dyestuffs is tabulated with their reactions to the following reagents: Sodium sulfate, sulfuric acid, nitric acid, benzol and pyridine, and sodium hydroxide alone and with sodium sulfate and with pyridine.

The causes of and identification of common imperfections in cotton goods, JOVANOVITS (*Textile World, 72 (1927), No. 5, pp. 33, 34, 37*).—Imperfections in cotton goods including weakening and destruction, fading and color changes, and imperfect dyeings are described, and methods for their determination are outlined.

The influence of various factors on the rate of drying of woollen and worsted fabrics, E. A. FISHER and G. BARKER (*Jour. Textile Inst., 18 (1927), No. 6, pp. T195–T206, figs. 5*).—In experiments at Leeds University rate of drying of wool cloth seemed closer related to the temperature of the surrounding air than to the actual temperature of the drying surface. The evaporation rate was greater near the edges and less toward the center of a drying fabric. The rate increased as the size of the fabric diminished, other experimental conditions being constant. With cloths differing in method of spinning, degree of twist, and variations in sets and picks, only type of finish had a marked effect on rate of drying, the clear cut, hard set finish losing on the average 57 per cent more water per hour than a soft, raised, and fluffy finish.

Machine for determining the resistance of fabrics to external abrasion, E. R. SCHWARTZ (*Textile World, 72 (1927), No. 6, pp. 83, 85, 87, figs. 8*).—A machine designed at the Massachusetts Institute of Technology for measuring wear on fabrics is described, with instructions for its use and examples of typical tests.

HOME MANAGEMENT AND EQUIPMENT

The household refrigerator (*Indiana Sta. Rpt. 1926, pp. 32, 33*).—Data from studies with two household refrigerators and on the effect of temperature maintenance on the keeping of foods showed that the better insulated refrigerator maintained a lower temperature in the food chamber with a smaller consumption of ice. The temperature maintained in the food chamber was found to depend largely on the amount of ice kept in the ice chamber. When only about half full the temperature in the food chamber began to rise rapidly. By keeping the ice chamber well filled, a fairly uniform temperature could be maintained in the food chamber.

The temperature on the top shelf of the food chamber in both refrigerators tested was found to range from 7 to 10° F. higher than that of the food compartment immediately below the cold air drop of the ice chamber. This difference was sufficiently great to make an appreciable difference in the keeping of some foods in good condition. It also indicated the direction of the circulation of the air within the food chamber.

How high should ironing board be? T. R. SNYDER (*Starchroom Laundry Jour., 34 (1927), No. 7, pp. 42, 44, 46*).—In a contribution from the Pennsylvania Department of Labor and Industry the results of a fatigue study made in connection with hand-ironing operations are reported. The study was made with 20 different operators. It was tentatively decided that an ironing board is of the proper height when it permits the operator to stand perfectly erect and easily grasp the handle of an iron while the arm is perfectly straight at the elbow and wrist and is separated from the body at an angle of between 35 and 40°.

In the study of some 25 or more ironing boards actually in use, it was found that the spring, or give, of an ironing board should not exceed 1 in. at the end under maximum pressure. Most hand ironers were found to gauge instinctively the degree of pressure which they are exerting on the work by the give of the board. When the give is excessive, an expenditure of additional effort is necessary to exert maximum pressure on the work, and there is a tendency

to throw the top plane of the ironing board considerably below the level which has been determined as its proper height. It was also found that no ironing board should require a forward reach by the operator in excess of 20 in., measured from the front edge of the ironing board, and preferably not more than 18 in.

With regard to the irons used, it was found that a hand ironer lifted the iron from the stand to the piece to be ironed approximately 100 times per hour. The distance that the iron had to be lifted averaged between 22 and 24 in. At an average weight per iron of 6 lbs., each operator is thus required to exert almost 1,200 ft. lbs. of energy per hour for the task of lifting the iron from the stand to the working plane. The use of wood, rubber, cork, or other shock-absorbing materials over floors tended to reduce feet and leg fatigue materially.

The conclusion is drawn that the relation of the height of the ironing board to the height of the operator is the most important point for consideration in a fatigue study of hand-ironing operations.

Veneers and plywood, E. V. KNIGHT and M. WULPI (*New York: Ronald Press Co., 1927, pp. XXIV+372, [pls. 107], figs. [55]*).—The purpose of this book is to set forth the facts, both historical and technical, relating to the origin and present-day production of veneers and of plywood. Part 1 contains chapters on evidence of the use of veneers in earliest civilization; disappearance of the art of veneering in the Middle Ages; forms of veneering in the Renaissance; popularity of marquetry and other forms of veneering in later French furniture; veneering in the Jacobean period; general use of walnut veneering in the Anglo-Dutch or Queen Anne period; veneering of mahogany and satinwood in the Georgian period; veneers and plywood in American colonial furniture; veneering in the nineteenth century after 1840; and twentieth century tendencies in solid and in laminated wood. Part 2 contains chapters on the utility of veneer; the superiority of plywood; advantages of plywood explained; curved shapes, a utilitarian veneered product; and engineering aspects of plywood. Part 3 contains chapters on the history of veneer making methods; modern manufacturing methods; various veneer woods and their identification; modern veneer cutting mills; preparing veneer for plywood; veneer uses other than plywood; storage and sale of veneer; plywood assembly, definitions, and outline; lumber cores and their preparation; glues used in the manufacture of plywood; gluing veneers under pressure; completion of glued stock; marquetry and inlays; variations in plywood construction; testing methods; veneer and plywood exhibitions; utilization of plywood; and specifications, statistics, and tables. A bibliograph is included.

MISCELLANEOUS

Yearbook of Agriculture, 1926, W. M. JARDINE ET AL. (*U. S. Dept. Agr. Yearbook 1926, pp. XXI+1298, figs. 270*).—This contains the report of the Secretary of Agriculture, a financial statement as to the Department's expenditures and income for the fiscal year ended June 30, 1926, nearly 300 brief articles arranged alphabetically by subjects and discussing recent developments under the general title of What's New in Agriculture, miscellaneous lists, and the usual statistics noted on page 686.

Work of the Umatilla Field Station in 1923, 1924, and 1925, H. K. DEAN (*U. S. Dept. Agr., Dept. Circ. 422 (1927), pp. 20, figs. 3*).—The experimental work reported as carried on at this farm, located near Hermiston, Oreg., is for the most part abstracted elsewhere in this issue. Meteorological observations are also included.

Thirty-ninth Annual Report of [Indiana Station], 1926, G. I. CHRISTIE and H. J. REED (*Indiana Sta. Rpt. 1926, pp. 68, figs. 25*).—This contains the organization list, a report of the director summarizing the activities of the station, the publications of the year, changes in staff, and a financial statement for the Federal funds for the fiscal year ended June 30, 1926, and for the remaining funds for the fiscal year ended September 30, 1926. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Report of Moses Fell Annex Farm, Bedford, Indiana, June, 1927, H. J. REED and H. G. HALL (*Indiana Sta. Circ. 143 (1927), pp. 18, figs. 6*).—The experimental work summarized in this report is for the most part abstracted elsewhere in this issue.

Annual Report [of Michigan Station], 1926, R. S. SHAW (*Michigan Sta. Rpt. 1926, pp. 23*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and a report on the work of the station, the experimental features of which are for the most part abstracted elsewhere in this issue.

Thirty-fourth Annual Report [of Minnesota Station], 1926, W. C. COFFEY (*Minnesota Sta. Rpt. 1926, pp. 55*).—This contains the organization list, a report of the director on the work and publications of the station, including brief abstracts of articles contributed to outside publications, and a financial statement for the fiscal year ended June 30, 1926.

Thirty-ninth Annual Report [of Tennessee Station], 1926, C. A. MOOERS ET AL. (*Tennessee Sta. Rpt. 1926, pp. 44, figs. 13*).—This contains the organization list, an account of the work of the station, and a financial statement as to the Federal funds for the fiscal year ended June 30, 1926. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

***Classified list of projects of the agricultural experiment stations,* 1925–26** (*U. S. Dept. Agr., Off. Expt. Stas., 1926, pp. 2+XIII+438*).—This is a revision in mimeographed form of the list previously noted (E. S. R., 53, p. 798).

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, [July–August, 1927] (*Ohio Sta. Bimo. Bul., 12 (1927), No. 4, pp. 105–136, figs. 5*).—This number contains, in addition to several articles abstracted elsewhere in this issue, the following: Farm Wages in Ohio, by J. I. Falconer; Carlot Unloads of Apples in Four Ohio Cities, by C. W. Hauck; and Index Numbers of Production, Wages, and Prices, and Land Utilization in Ohio, both by J. I. Falconer.

NOTES

Colorado College and Station.—An altitude laboratory has been constructed for the section of home economics, which will provide and maintain atmospheric pressures ranging from sea level to 15,000 ft. altitude for the purpose of testing the effect of atmospheric pressure upon baking and cooking operations. The cost of this laboratory was approximately $1,600.

An addition to the entomology building costing approximately $700 has been constructed for use as a parasite laboratory in connection with codling moth control work.

Dr. W. H. Feldman, assistant professor and assistant in veterinary pathology, has resigned to accept a position with the Institute of Medical Research of the Mayo Foundation at Rochester, Minn., and has been succeeded by Dr. Henry L. Morency. Dr. Charles I. Bray, associate professor of animal husbandry and associate in animal husbandry investigations, has accepted a position as head of the department of animal industry in the Louisiana University. Otto V. Adams, associate in civil and irrigation engineering, has accepted a position as associate in civil engineering at the Texas Technological College.

Charles R. Jones, associate professor of entomology and zoology and associate in entomology, received the degree of doctor of philosophy from the Iowa College at its 1927 commencement. Arthur Moinat, assistant in horticulture, has been granted leave of absence for Ph. D. work at the University of Illinois.

Florida Station.—Charles R. Enlow and Fred H. Hull have been appointed assistant agronomists, the former to have charge of the grass plats and forage crops studies in cooperation with the U. S. D. A. Bureau of Plant Industry and the latter to devote his time chiefly to genetics and plant breeding. Ernest G. Moore has been appointed assistant editor, effective September 15.

Massachusetts College and Station.—The total registration is estimated at about 800 students.

Dr. Henry T. Fernald has been appointed director of the graduate school, and Dr. Clarence E. Gordon, head of the division of science. Donald W. Sawtelle, assistant professor of agricultural economics, and Richard W. Smith have resigned, the latter to accept a position with the University of Vermont. Leon R. Quinlan, assistant professor of landscape gardening, has accepted a similar position in the Kansas College, and L. B. Arrington, instructor in horticulture, a similar position in the Pennsylvania College. Clarence C. Coombs has been appointed instructor in landscape gardening, Carlton B. Cartwright instructor in horticultural manufactures, and Dr. Wilbie S. Hinegardner instructor in physiological chemistry.

Michigan College and Station.—The budget allowance for the station for the year 1927–28 is $363,300 plus receipts.

The entering class in the agricultural division of the college numbers 152, the largest class of agricultural students within the past 5 years.

Following 51 years as student, faculty member, and president, Frank S. Kedzie has resigned as dean of applied science to become college historian. Dr. Ernst A. Bessey has been appointed acting dean of the division. J. T. Horner, professor of economics, has been granted a year's leave of absence to attend the Robert Brookings Graduate School and Institute of Economics.

Mississippi College and Station.—D. S. Buchanan, associate professor of animal husbandry in the Texas College, has accepted a position with the animal husbandry department and is also being employed on a part-time basis by the college as professor of animal husbandry, succeeding C. J. Goodell.

New York State Station.—Leon R. Streeter has been promoted to associate in research (chemistry). Miss Olive Hoefle has been appointed assistant in research (botany), effective October 1.

Rhode Island Station.—Recent appointments include John C. Weldin, Ph. D., assistant professor of bacteriology at the Iowa College, as chief of animal breeding and pathology, vice Henry G. May, deceased. Helen J. Weaver has been appointed assistant in animal breeding and pathology, vice George A. Cruickshank, resigned, and J. Eric Blaney, assistant in chemistry, vice Robert A. Greene, resigned.

South Carolina College and Station.—Work on the new engineering building, which is being erected at a cost of $250,000, is rapidly going forward. The building will be of reinforced concrete construction, faced with brick.

The completion of the new $25,000 poultry plant, made possible by a private donation, has been followed by the undertaking of research work with poultry under the direction of C. L. Morgan.

A new station greenhouse has been completed. The building measures 25 by 50 ft., has a 25-ft. square service room and laboratory, and is steam heated by means of an oil-burning boiler.

Farmers' Week, held from August 29 to September 3, under the auspices of the extension service, was instrumental in bringing the station into direct contact with more than a thousand farmers and led to much favorable comment on the work which is being done.

Dr. A. H. Meyer has been appointed associate agronomist in the station for studies in soil chemistry and soil bacteriology. A. M. Carkuff has been appointed assistant professor of agricultural economics and assistant agricultural economist, vice F. H. Robinson, resigned to accept a position with the U. S. D. A. Bureau of Agricultural Economics.

South Dakota College.—As discussed editorially on page 601, the Lincoln Memorial Library, an imposing four-story brick and stone structure providing stack space for 300,000 volumes, was dedicated by President Coolidge September 10. A portion of the space will for the present be used for a college museum and for a considerable number of classrooms, but will ultimately be available for library purposes. An alcove facing the main entrance will house a statue of Abraham Lincoln to be sculptured by Gilbert Riswold, a former student of the college.

Wisconsin University and Station.—The State legislature has appropriated $3,481,541 for carrying on the university work at Madison. There is available $50,000 for research on special investigations, $341,220 for university extension, $30,000 for farmers' institutes, $60,000 for agricultural extension, $30,000 for substations, $5,000 for corn borer work, $63,100 for county agricultural representatives, $5,000 for the State soils laboratory, $2,500 for hog cholera serum, $6,950 for tobacco experiments, and $5,000 for experiments with truck crops.

Imperial College of Tropical Agriculture.—Geoffrey Evans, formerly in the Indian Agricultural Service, has been appointed principal of this college. Henry A. Ballou, professor of entomology and head of the section of entomology and zoology, has been appointed by the British Government to the newly established office of Commissioner of Agriculture for the British West Indies. He will retain his connection with the college, but will be occupied largely in an attempt to coordinate the scientific and practical work of the institution and the departments of agriculture of the various islands.

Albert Agricultural College.—According to a note in *Nature*, this college, located at Glasnevin, Dublin, and engaged in agricultural teaching and research since 1851, has recently been reorganized to accommodate the enlarged agricultural faculty of University College (National University of Ireland) and will henceforth be under university control. Recent appointments include J. P. Drew as director and professor of agriculture, Dr. P. A. Murphy as professor of plant pathology, and E. J. Sheehy, George Stephenson, M. J. Gorman, M. Caffrey, and G. O. Sherrard as lecturers in animal nutrition, agricultural chemistry, agricultural botany and bacteriology, plant breeding, and horticulture, respectively.

Hokkaido Agricultural Experiment Station.—A recent report of this institution describes the work of the station, with its 4 substations and 6 special experimental farms maintained by Federal funds, and 9 experimental farms maintained by local funds. The main station farm comprises an experimental area of about 40 acres at Sapporo and 83 acres at Kotoni-mura. There is also an experimental orchard of 12 acres at Kotoni-mura, peat bog experimental farms of 11 and 129 acres, respectively, at Hassabu and Numakai-mura, a volcanic ash experimental farm at Hayakita of 71 acres, and the Ichikishiri Mulberry Garden of 33 acres.

The main station is organized into sections of general affairs, agronomy and horticulture, agricultural chemistry, sugar beet culture, phytopathology and entomology, and sericulture, with a total scientific staff of about 40 specialists, and the branch stations include about 30 others. Among the special lines of work are flax investigations, a seed and nursery stock farm, the production of standard silkworm eggs, and the model orchards. In addition to 17 reports, the station has issued through 1926 42 bulletins and 41 circulars.

New Journals.—*Food Manufacture* is being published in London as a monthly journal of the food industry. The papers in the initial number include Scientific Control in the Food Industry, by J. V. Backes; The Spoilage of Foodstuffs, by E. H. Callow; Jam Manufacture, by H. Mansfield; On the Paucity of Technical Periodicals Dealing with Cocoa, Chocolate, and Confectionery, by A. W. Knapp; The Raw Material of the Bacon-Curing Industry, by F. W. Jackson; Bacteria and the Canning Industry, by R. F. Hunwicke; and The Estimation of Preservatives in Foodstuffs, by H. Drake-Law. Lists of current literature and recent patents are appended.

Nederlandsch Tijdschrift voor Hygiëne, Microbiologie, en Serologie is being published from time to time as the organ of the Netherlands Society of Microbiology. The initial number contains twelve original articles, most of which deal with bacteriological problems, and one of which, by H. S. Frenkel, is entitled Contributions to the Knowledge of the Feeding of *Anopheles maculipennis* in the Netherlands.

Boletín de la Subdirección Técnica Agropecuaria del Litoral is being issued in mimeographed form by the Department of Agriculture of Ecuador. Its primary purpose is to acquaint the farmers of Ecuador with the more popular findings of work under way. The initial number dealt especially with cacao problems and the standardization of Ecuadorian products.

Acta Horti Botanici Universitatis Latviensis is being issued at the rate of three numbers per year. The initial number contains several original articles, one of which, available in German, presents an account by N. Malta of the distribution of *Betula nana* in Latvia.

EXPERIMENT STATION RECORD

VOL. 57 DECEMBER, 1927 No. 8

The retirement from the Alaska Experiment Stations during the current month of Dr. Charles Christian Georgeson removes from active service still another of the few survivors of the pioneer days in experiment station development. Dr. Georgeson had been in charge of the agricultural investigations in Alaska since the establishment of headquarters at Sitka in 1898. The first experimentation in the region was begun under his direction, and its subsequent expansion and development took place during the succeeding years of his leadership. While he had had the long-continued and loyal assistance of able associates in this work, he had come to be looked upon as almost personifying the station enterprise in the Territory, and his retirement at the mature age of 76 years may be said to mark the completion of the first or formative period of its history.

By temperament, training, and experience, Dr. Georgeson was peculiarly well equipped for his allotted career in Alaska. He is a native of Denmark, and had made a study of Danish agriculture before coming to this country as a young man in 1873. Five years later he was graduated from the Michigan State College, and in 1882 he was granted the degree of master of science. He was an assistant editor of the *Rural New Yorker* from 1878 to 1880, professor of agriculture and horticulture in the Texas College from 1880 to 1883, and professor of agriculture in the College of Agriculture of the Imperial University of Tokyo from 1885 to 1889. On his return from Japan, he served as professor of agriculture in the Kansas College from 1890 to 1897, but spent several months in 1893 as a special agent for the Federal Department of Agriculture in a study of the dairy industry of Denmark. Thus he had had opportunity to observe much of practical agriculture under a wide range of conditions. Supplementing this varied experience, with its inevitable stimulation of a spirit of resourcefulness, was his habitual enthusiasm and perseverance, and perhaps most characteristic of all, his indomitable belief in the agricultural possibilities of Alaska.

For many years after the acquisition of Alaska by the United States little thought was given to the region by anyone from an agricultural point of view. Previous to 1898 but few persons would

admit that agricultural operations were possible, and it was popularly believed that the fisheries, the fur trade, and mining were the only industries that were available. Attempts while Alaska was under Russian control to introduce various crops and different kinds of livestock had been spasmodic and had met with little success, and for more than a quarter of a century after the Russian withdrawal no attempt was made by this country to encourage agriculture.

With the influx of population following the discovery of relatively large amounts of gold in the Yukon Valley, public attention was strongly turned to Alaska. There was an increasing realization that this vast region contains large natural resources in its minerals, forests, and fisheries, and a gradual awakening to the fact that it would be difficult to maintain a sufficient population to develop these resources fully unless a considerable portion of the food supply could be obtained from the Territory itself. This feeling led to a demand that the Federal Government should undertake a study of its agricultural possibilities.

Following a suggestion from the Director of the Office of Experiment Stations in his report for 1896, an appropriation of $5,000 was made by Congress to the Federal Department of Agriculture for an investigation of the agricultural resources and capabilities of Alaska. Agricultural surveys of the coast region from the southern boundary as far west as Unalaska were carried out in the summer of 1898 by Dr. W. H. Evans, then botanist of this Office, and Mr. Benton Killin, a member of the board of regents of the Oregon Agricultural College, and of the Yukon Valley by Dr. Sheldon Jackson, superintendent of Government schools and reindeer experiments in Alaska. These investigations indicated that very little agriculture was being practiced, but that various crops, especially vegetables and berries, were being successfully grown in different localities and that livestock was being kept to a limited extent.

The Alaskan work was continued the following year by Congress with an appropriation increased to $10,000. Headquarters were established at Sitka in May, 1898, and Dr. Georgeson was appointed special agent in charge of the investigations. Under his direction experiments were begun in growing cereals of various kinds, forage plants, flax, and vegetables at Sitka and Skagway. The botanical survey of the coast region was again continued by Dr. Evans.

The legislation of the ensuing year definitely authorized the establishment and maintenance of agricultural experiment stations in Alaska under the direct management of the Department of Agriculture and with an appropriation of $12,000. Steps were accordingly taken for the organization of this work as a part of the duties of the Office of Experiment Stations and upon a permanent basis. At

Sitka a two-story frame building containing offices, laboratories, and quarters for the special agent in charge was begun. Several acres of the tract of 110 acres which had been reserved for station use were cleared, as was also a portion of a similar reservation of 329 acres on the Kenai Peninsula, where a small log barn and silo were erected.

The pioneer conditions under which the new stations began operations can hardly be realized. Settlement had been largely confined to a few spots scattered along the hundreds of miles of coast line, and transportation facilities even in this region were exceedingly meager and uncertain. Communications were correspondingly slow, and the general status was one of great isolation.

At Sitka the land available for station use was for the most part an old forest from which the timber had been removed, but with innumerable spruce stumps still remaining. Much of the tract was also covered with a layer of moss, which had greatly retarded the weathering of the soil, and this was in consequence unusually cold, raw, and sour, and in part reclaimable only by means of drainage. At Kenai nearly the whole tract was covered with small timber.

Lack of knowledge as to the precise influence of the climate upon prospective agricultural development was early realized to be one of the handicaps which must be overcome. Temperature observations had been made by the Russians at Sitka from 1828 to 1876 and by the U. S. Signal Service from 1881 to 1887, and a limited amount of data was available for other points, but there was little reliable information as to actual conditions on such matters as length of frost-free period and the precipitation and maximum and minimum temperatures during the growing season. In 1898 the Weather Bureau of this Department undertook the establishment of a special meteorological service for Alaska, with headquarters at Sitka, and in the succeeding years the experiment station assisted in obtaining observations there and at various other points where its representatives were located.

Another outstanding difficulty confronting the stations was the shortage and high cost of labor. This factor has greatly increased the expense of buildings and equipment and the carrying on of all station operations, and with the small appropriations available has measurably retarded the rapid expansion of a full experimental program. Many things for which labor would ordinarily be hired have had to be done by the staff itself. The reservations of public lands set aside for station use at Sitka, as well as at several other points, were surveyed by Dr. Georgeson personally, and not a little of the work of development which followed was literally carried on by him "single-handed and alone."

Early operations necessarily centered around the more accessible coast region, although it was realized that the findings for that section would be of only localized application. Reconnaissance surveys were soon begun, however, in the great interior valleys, and in 1900 a tract of 313 acres, mainly virgin forest, near Rampart on the Yukon River was reserved for station use, and work with cereals, forage crops, and vegetables was actively undertaken the following season. In 1901 a tract of 775 acres near Copper Center, adjoining the Copper and Klutina Rivers, was surveyed and a station located to investigate the possibilities of this apparently promising region. In 1907 the influx of settlers into the Tanana Valley led to the opening of a station near Fairbanks on a tract of approximately 1,400 acres, and similar influences in 1917 to a station 300 miles to the south at Matanuska, where a tract of 240 acres was made available.

Although the various stations were opened and developed with a view to permanency, changes and readjustments were more or less inevitable. By 1908 it had become apparent that the coast regions offered greater promise for stock raising than for general farming, and a shift in transportation routes and other causes made advisable a transfer of the work at Kenai to Kodiak Island and a concentration of effort upon animal husbandry and dairying. Despite its southerly location, the Copper River region proved more susceptible to drought and untimely killing frosts than much of the country to the north, and this coupled with the limited agricultural development of the region and its relative inaccessibility and high maintenance costs led to the closing of the Copper Center Station in 1908. Insufficient funds were a controlling factor in the suspension of operations at Rampart in 1925. All of these stations, however, had been under way for a period sufficiently long to accumulate data of great value as to conditions and prospects in their respective localities.

No account of the Alaska Stations would be complete without emphasis on the fortitude, resourcefulness, and loyalty of their personnel. The continuous struggle with the rigors of the Alaskan climate, the isolation of most of the stations and particularly that at Copper Center, where transportation inadequacy was reflected for years in a standard charge from the coast of 20 cents per pound on all freight in winter and of 50 cents per pound at other seasons, and such unexpected calamities as the volcanic eruption of Mount Katmai in 1912 and the consequent interruption of operations on Kodiak Island for about two years, may be cited as only a few of the difficulties under which the work was organized and carried on.

It is a matter worthy of special mention that despite these handicaps high ideals and standards were formulated and maintained. Although working under pioneer conditions the stations have never been allowed to drift into mere demonstration enterprises, but have

been developed consistently as agencies for real experimentation. To no small degree this has been the result of Dr. Georgeson's personal attitude and viewpoint as a scientific worker, an attitude fittingly recognized some years ago in the conferring upon him by his Alma Mater of the honorary degree of doctor of science. It has meant much to the cause of agricultural science in general that men of this type and viewpoint have been available as organizers and leaders.

The results which the stations have secured have been reported year by year and duly abstracted in the *Record*, and a summary of even the more striking findings would far exceed the limits of this article. A vast store of information has been acquired, especially as regards the growing of cereals, vegetables, and small fruits, the practicability of animal husbandry and dairying, the cost of clearing land, and many other phases of pioneer agriculture.

Grain farming, once regarded as out of the question, has been conclusively proved to be possible throughout large areas of the Territory, while many others have been shown to be well adapted to cereal growing for hay. Improved strains of early-maturing wheat, barley, oats, and rye have been developed and disseminated, and many special cultural practices devised. To-day wheat yields of 18 to 25 bushels per acre are not uncommonly reported by farmers, and a mill at Fairbanks ground about 1,600 bushels of wheat last year. Valuable information has also been obtained as to other field crops, and one interesting development of the 1926 season was the growing of experimental acres of sugar beets at the Fairbanks and Matanuska Stations, with a sugar content of about 17 per cent.

Much time has been spent by the stations in developing varieties of potatoes that are early, heavy yielders, and of fine quality. During the past season a surplus of potatoes was produced in the Territory, and a trial shipment to Seattle was favorably reported as to quality.

Although little encouragement has been obtained for the success of tree fruits in Alaska other than some of the hardier apples, one of the important achievements of the Sitka Station has been the success with many small fruits, particularly strawberries, currants, and raspberries. Special mention should be made of the strawberry hybridization work, which has been conducted on a large scale for several years and has resulted in great improvement of the native stock. Some of these strawberry hybrids have been found to be good producers, of high quality, and hardy even in the Matanuska Valley. Practically all of the strawberries now grown in Alaska for market or domestic use are of varieties originated at the Sitka Station

Another recent horticultural development of promise is the experimental work in bulb growing, begun at Sitka in 1923. This work has already demonstrated that bulbs of narcissus and tulips can be successfully grown on a commercial scale in southeastern Alaska.

Of late years increasing attention has been given to animal husbandry. A herd of Galloway cattle is maintained at Kodiak and has demonstrated the fitness of this breed for the climatic conditions of this region. The possibilities of dairying have been studied there and also at Fairbanks and Matanuska, and much interest has been aroused in these localities in this type of farming.

The history of the Alaska Stations well illustrates the great contribution to the public welfare which is being made by experimental work in agriculture. On the negative side, these stations have been a great protection and reliance to prospective settlers by their ascertaining of the limitations of the Territory. Costly mistakes by individuals have thereby been avoided, and in the aggregate the economic waste thus saved which would otherwise have been well-nigh inevitable has probably repaid many times over the whole cost of the stations. The fact that the burden of these mistakes would have fallen on the shoulders of a class of people of very limited resources and to whom they might easily have brought complete financial disaster is of especial appeal from the humanitarian point of view.

Even more significant and important are the positive achievements of the stations. It has been shown definitely, for instance, that a more or less specialized agriculture is not only possible but profitable over wide areas of this immense region; that stock raising is easily feasible over many other portions; that the growing of many vegetables can be depended upon to furnish a noteworthy and important share of the family living and to add greatly to the variety and wholesomeness of the diet; and that many fruits and flowers can be successfully cultivated to an extent which enhances appreciably the attractiveness of the daily life.

Many other factors, of course, have contributed to the development of Alaskan agriculture within the last quarter of a century, yet the influence of the experiment stations has been very potent. The full measure of this influence can not here be evaluated, and it is a matter of regret that no complete summary has thus far been assembled. It would seem to be most appropriate if Dr. Georgeson himself, now relieved of the burdens of active leadership, and whose fortune it has been to be associated with this enterprise so intimately from the very beginning, could prepare an authoritative history. This would be a service which no other hand could aspire to render so effectively, and one which would be of unique interest and value alike to those who are concerned with the development of Alaska and the growth of the American agricultural experiment stations.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid dynamics, V. Cofman (*Chem. Rev., 4 (1927), No. 1, pp. 1–49, figs. 16*).—This paper presents a new theoretical treatment of the physical chemistry of colloids, together with some experimental data on the swelling pressure of gels, the concentration of soap in films, and the velocity of adsorption at liquid surfaces.

The similarity between the following variables and phenomena is discussed: P'=colloid pressure (swelling pressure of gels; surface pressure of adsorbed molecules), and P=osmotic pressure; V'=volume of gel (volume of surface region), and V=volume of solution; T'=colloid potential (pH, in special cases), and T=temperature, or heat potential; E'=colloid energy (electro-chemical energy), and E=heat energy or molecular energy; S'=colloid entropy $\left(\int\frac{dE'}{T'}\right)$, and S=heat entropy $\left(\int\frac{dE}{T}\right)$; M'=mass of oriented molecules, and M=mass of solute molecules; F'=partial molal free energy (or $\frac{dE'}{dM'}$), and F=partial molal free energy $\left(\frac{dE}{dM}\right)$; adsorption at surfaces, and two-phase distribution of crystalloids; spontaneous dispersion, and boiling of liquids; lyophobic and lyophyllic colloids, and vapors and permanent gases; electro-osmosis, and "thermoosmosis"; stream potential, and "stream temperature"; electrophoresis and "thermophoresis"; and other pairs of phenomena.

Recent advances in the determination of the structure of proteins, E. Klarmann (*Chem. Rev., 4 (1927), No. 1, pp. 51–107*).—Following a general introduction, the progress of structural protein investigation is taken up in some detail under the following headings: Aliphatic and cyclic compounds among the products of protein degradation; new conceptions of valence and their application to protein structure; the theories of cyclic structure of proteins, including (1) the pyrrole theory, (2) the dioxopiperazine theory, (3) the Waldschmidt-Leitz experiments, (4) the synthetic heterocyclic compounds, (5) the iso- and allodioxopiperazines, and (6) the ureide theory. A bibliography of 154 references is appended. A considerable number, however, of recent American papers on the hydrolysis of certain proteins and the isolation of the resulting amino acids remain unmentioned in either the text or bibliography.

Studies on precision methods in volumetric analyses, I–III [trans. title], K. O. Schmitt (*Ztschr. Analyt. Chem., 70 (1927), Nos. 6, pp. 230–235, fig. 1; 9, pp. 321–341; 71 (1927), No. 8, pp. 273–290, fig. 1*).—The following papers are presented:

I. *A discussion of methods and their accuracy.*—This is a general discussion of methods and their relative accuracy. The weighing pipette is recommended for accurate work, together with solutions of normality expressed in integral and fractional equivalents per kilogram of solution, rather than per liter as

customary. A literal calculation of the probable maximum error, taking into consideration the indicator error, concludes the discussion.

II. *Primary standards for the preparation of volumetric acid solutions.*—The conversion of acid carbonates into carbonates by heat was investigated at various temperatures between 100 and 700° C. The usual methods of determining very small quantities of hydroxide in the presence of carbonate by the precipitation of carbonate with varying chloride, and determination of the hydroxyl ion with phenolphthalein and the silver precipitation method were subjected to a careful study and were found insufficient. A procedure is given by which, from the effective titration value of a bicarbonate preparation and from the loss in weight on converting into carbonate, the oxide content of the carbonate can be determined. A method is given for the preparation of pure potassium bicarbonate, and the conclusion reached that it is unconditionally essential to secure very fine crystals. The effective titration value of the potassium bicarbonate preparation lay between 100.00 and 99.98 per cent. The application of the theory of carbonate equilibria to the titration of carbonates and bicarbonates is partially discussed.

III. *On primary standards for the preparation of volumetric alkali solutions.*—Preparations of oxalic acid and of potassium oxalate of a purity between 99.96 and 100 per cent were made and were employed in a critical examination of alkalimetric titration procedures and in the preparation of potassium tetroxalate. It was found that potassium tetroxalate was best made by crystallization from a solution of oxalic acid and potassium oxalate in the equivalent proportions of 3 : 1 or a little more. A thorough investigation of the titration of oxalic acid, using a carbon dioxide insensitive indicator such as methyl orange or dimethyl yellow, and precipitating the oxalate ion by means of calcium chloride, was carried out, the resulting conclusion being that calcium oxalate free from the basic or acid salts is only obtained when the solution from which it is precipitated is neutral or when the precipitation is made slowly and from a hot solution, and that only under such conditions will the titration yield accurate results for oxalic acid.

A theory of tanning based upon the study of tanning effects of naphthalene derivatives and other organic compounds, Y. H. Li (*Jour. Amer. Leather Chem. Assoc., 22 (1927), No. 8, pp. 380–444*).—Following a brief review of the literature, 29 experimental tanning tests of various series of organic compounds, mostly α- and β-naphthol derivatives, are described and discussed. The drum tannage process was used, comparatively short periods being employed.

The α-naphthol derivatives, from comparatively simple compounds to dyes of rather complex structure, all showed some tanning properties, from slight to very satisfactory tannages being obtained from one or more of each type of α-naphthol derivatives tested. β-naphthol derivatives were not satisfactory except in the presence of ferric chloride. A variety of compounds having sulfonic acid groups, nitro groups, aldehyde groups, etc., in place of the hydroxyl groups failed entirely to show a tanning action.

The theory of tanning developed on the basis of these experiments and designed to account for the action of both natural and artificial organic tanning agents in general includes the following postulates: (1) Tanning is a chemical condensation of hydroxyl groups in the tanning agent with amino groups in the hide proteins, resulting in the formation of such combinations as –NH·R and –N·R·R by the elimination of one or of two molecules of water, respectively. (2) The hydroxyl group must be in a position such that the condensation product may be stable, this condition being apparently satisfied by such

approximately "central" positions as that of the single hydroxyl group of α-naphthol, etc., but not by the single hydroxyl group of β-naphthol; by the carbinol hydroxyl of certain triphenylmethane dyes, etc.; and by two hydroxyl groups, not necessarily centrally placed, but in more or less symmetrical relation, so that "the molecule is tied at both ends in a well-balanced condition" as in the dinaphthols, α or β, produced by the action of ferric chloride upon the naphthol. In support of this theory are adduced the behavior of hydroxy fatty acids, hydroxystearic acid, having the hydroxyl group at or near the center of the chain, and showing a distinct tanning action; and other facts from the author's experiments and those of other investigators. (3) Other constituents may influence either positively or negatively the effectiveness of the hydroxyl groups so placed as to possess a tanning effect, but can not of themselves create a tanning effect in the absence of such hydroxyl or entirely destroy such action when present.

SOILS—FERTILIZERS

[Soil studies at the Idaho Station] (*Idaho Sta. Bul. 149 (1927), pp. 12, 13, 14, 20, 22, 23, 43, 44*).—The following investigational work is briefly summarized:

[*Studies of alkali soils*] (pp. 12, 13).—A study of the effectiveness of drainage is very briefly reported, together with laboratory studies indicating that the physical condition obtained by different treatments constitutes as important a factor in crop reduction as does the actual alkali salt content of the soil. Chemicals found to be in greater or less degree correctives for alkali soils are sulfur, gypsum, alum, iron sulfate, and sulfuric acid. Large-scale field experiments have been made possible by these laboratory tests. At Banida, shallow tile drainage placed in 1924 has been found effective for the removal of salts from the surface soil and has resulted in materially increased crops. The removal of salts has developed some alkali, however, with the undesirable structure usual in carbonated soils.

Fertility of coniferous timber soils (pp. 13, 14, 22, 23).—Pot cultures of timber soils have shown that fertilizers, with the exception of nitrates, have little effect. Nitrogenous fertilizers somewhat increased crop yields, but did not give as great an increase as was expected. A study on nitrogen fixation by the department of bacteriology tended to confirm the conclusion from the chemical data that resin-like bodies capable of inhibiting nitrification and also somewhat toxic to plant growth in culture solutions are in some measure responsible for the partial failure of nitrogenous fertilizers. Results as to nitrogen fixation on adding various tree products (leaves, needles, and sawdust) were conflicting. The nitrogen fixation capacity of these soils, locally known as "turpentine soils," averages very low, some of them being quite incapable of fixing nitrogen. Four out of 24 representative forest soils did not contain Azotobacter when collected, and 16 (largely those bearing virgin timber) out of 31 samples were unable to form nitrate from ammonium sulfate or blood.

Slick spot soils (pp. 43, 44).—Up to the present time, at the Caldwell Substation, applications of manure and the growing of sweet clover on slick spots seem the most feasible means of improvement.

Certain soil profiles in southern Illinois, R. A. NORTON and R. S. SMITH (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 324–332, figs. 2*).—Studies of five types of Illinois soil profiles are reported. The results are considered to indicate a good correlation between topography and drainage and important soil characters. With an increase in slope and drainage, decreases were noted in

compaction, plasticity, the thickness of the ashy gray layer A_2, the depth to the B horizon, the thickness of this horizon and the depth to the C horizon, the lime requirement as indicated by pH value, and the gray color in the profile. Oxidation and color increase with an increase in the slope and drainage. Cultivation in this area has lightened the surface color by mixing some of the A_2 with the A_1 horizon. It has increased the lime requirement and intensified the plasticity and compaction in the B horizon.

The Grundy soils of Nebraska, F. A. HAYES (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 311–323, fig. 1*).—The location, topography and occurrence, drainage, altitude and slope, climate, native vegetation, and parent soil material of the Nebraska Grundy soils are noted, and a detailed description of the profile and its various horizons is given.

The upper three horizons, a structureless mulch, a laminated horizon, and a granular zone, all friable and remarkably uniform in structure and relative position, exist throughout the area. The fourth horizon is that of maximum compaction. It varies markedly in color, density, and structure, but does not reach the friable condition of the corresponding layer of the Holdrege and Marshall soils. The fifth horizon is more variable than those above, being characterized by differences in the content and distribution of lime. Throughout the southeastern part, including about 50 per cent of the Nebraska Grundy soils, there is a definite lime accumulation zone, beneath which carbonates could not be determined in the field. Another area with a definite lime accumulation zone in the profile was found in the western part of the Grundy region. In the northern part, including the remainder of the main Grundy region, is a small area which has developed no lime accumulation zone.

The cultivation of field soils in connection with agricultural soil practice, F. GLANZ (*Die Wühlarbeit im Ackerboden im Sinne der Landwirtschaftlichen Bodenbearbeitung. Vienna and Leipzig: Carl Gerold's Son, 1926, 2. ed., rev., pp. [4]+142, pls. 6*).—This is a second edition (E. S. R., 48, p. 616), somewhat enlarged and brought up to date with respect to the considerable recent advances in the knowledge of agricultural soils and their management.

Chemical determinations to be made in the course of a soil survey, P. L. GILE (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 285–289*).—In view of the fact that "an active and inquiring soil surveyor can collect enough samples in a month to keep a rapid analyst occupied for a year" it is evidently necessary to make a selection from among the numerous determinations which might be useful, if it were possible to make them. Determinations suggested as of special importance as a supplement to the field characterizations obtained in a soil survey are the elementary compositions of the coarse mineral and colloid fractions and the proportions of colloids. Since the pH value and base exchange capacity both correlate fairly well with the silica : iron-aluminum ratio in the colloid, and in view of the fact that the lime requirement is conditioned by both pH value and base exchange capacity, it is considered that "determinations of pH, exchange capacity, and lime requirement will be chiefly confirmatory of the more fundamental determinations of the composition and quantity of colloid in the soil," although in many cases "these determinations may bring out minor differences in the colloidal material not revealed by the chemical composition."

The hydrometer as a new and rapid method for determining the colloidal content of soils, G. J. BOUYOUCOS (*Soil Sci., 23 (1927), No. 4, pp. 319–330, pl. 1*).—The experiments reported consist essentially of (1) a study of the relation of the density of soil suspensions as measured at intervals of from 1 minute to 24 hours after dispersion to the colloid content, as determined by the heat-of-wetting method and by other procedures, and (2) a study of meth-

ods of dispersion, resulting in the observation that a soda fountain drink mixer, the cup of which has been provided with suitable ribs of wire to baffle the rapid circulatory currents in the disturbed liquid gave complete dispersions in 9 minutes, whereas the cup without the added baffles required about 3 hours. The density of the suspensions 15 minutes after dispersion was found so closely related to the colloid content as to permit of determinations closely approximating those made by the heat-of-wetting method in a considerable variety of soil types tested. A hydrometer specially devised for this work, of large size and graduated to read directly grams of suspension per liter of water was used. The samples examined were 25, 50, 75, and 100 gm., suspended in each case, after adding 5 cc. N/1 potassium hydroxide to prevent flocculation, in 1,000 cc. of water.

Results of some physical and chemical studies on soil colloids, M. M. McCool (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 289–297*).—Determinations of the colloid content of nine soil types, including loam, sandy loam, heavy sandy loam, silt loam, and light sandy loam, made by calculation from the ratio of heat of wetting of the isolated colloid to heat of wetting of the whole soil are reported, together with chemical analyses of the colloids for nitrogen, potash, soda, phosphoric anhydride, lime, magnesia, and silica.

The proportion of colloid as determined by the heat-of-wetting method was uniformly much greater than that indicated by the mechanical analyses—in one case more than the total of silt and clay together as determined mechanically and in several cases nearly as great as the mechanically determined silt and clay total. It is suggested that "if the results obtained by the standard method of mechanical analysis do not represent the true amounts of the fine sands, silt, and clay in all instances, it is largely on account of incomplete dispersion of the samples when shaken, and if such is the case it would seem that the proportions of the various grain sizes called for in the textural classification now in vogue need revision."

From the chemical analyses it is concluded that apparently "the soil colloids during the processes of weathering of soils, owing to their great adsorptive capacity, act as valuable protecting agents with respect to several important elements that are utilized in the nutrition of plants," the proportions of nitrogen, potash, phosphoric anhydride, and lime being in most cases from noticeably to strikingly high in the colloid fractions analyzed. Attention is drawn to the fact that in the dispersion of the fine materials nothing was discarded, the extracts being evaporated to dryness and the entire residue analyzed. This is regarded as important on account of the risk otherwise involved of losing an important proportion of the adsorbed bases in the large volumes of water used.

The normal moisture capacity of soils, C. F. Shaw (*Soil Sci., 23 (1927), No. 4, pp. 303–317, figs. 4*).—Experiments on the rate and depth of penetration and on the distribution of water added to comparatively dry soils are reported. The procedure consisted essentially in filling 4-in. brass tubes 1.5 to 3 ft. long, or, in a few tests, 6- and 8-in. iron tubes 4 to 8 ft. long with a suitable soil, followed by the addition at the surface of water sufficient to give an irrigation of the desired depth, a usual head of from 1 to 1.5 in. being maintained until all the water had been applied. The tubes were covered with a close, but not air-tight top immediately upon the disappearance of the water from the surface.

From the data obtained with respect to percentage of moisture in each inch of soil in the tubes after various intervals, and from a consideration of plots of these data, it was concluded that soils possess a normal moisture capacity, defined as the minimum amount of water that is retained by absorption and film forces when the water is free to move downward through a mass of uniform

soil, which is approximately the same as the moisture equivalent. At the normal moisture capacity the moisture was found readily available for plants, but not free to move under the normal film forces existing in the soil. When the soil moisture is equivalent to this normal moisture capacity it is considered that mulches will be of little or no effect, inasmuch as upward movement to supply evaporation does not occur. It is further pointed out that in deep uniform soil water added by rain or irrigation penetrates the soil rapidly and soon approaches a state of distribution represented by the normal moisture capacity, beyond which the storing up of water in a deep soil by winter irrigation or ordinary application of excessive amounts of water early in the season can not take place unless the soil lies upon an impervious layer capable of producing a perched water table and a zone of saturation.

Studies of the removal of nutrients from subsoil by alfalfa, C. E. Millar (*Soil Sci., 23 (1927), No. 4, pp. 261–268, pl. 1*).—Report is made of a series of experiments with alfalfa at the Michigan Experiment Station, in which the extraction of nutrients from the surface soil to a depth of from 8 to 15 in. was prevented by surrounding the roots with 2-in. glass tubes to the depth indicated. The tubes were filled with surface soil, subsoil, or with pure quartz sand.

Eight-in. cylinders did not appear to decrease growth as measured by three annual cuttings in two successive years. Nutrient solutions applied near the taproots at various depths increased the top growth of plants with cylinder-inclosed roots, and when the nutrient solutions were applied to the lower soil horizons a considerable development of fibrous roots occurred in the region of applications; but plants whose roots were not restricted by the cylinders showed little response to applications of nutrient solution. In the case of 15-in. cylinders filled with quartz sand, 5 out of 7 plants lived two years, three cuttings being taken each year. Two of the plants lived three years.

The soil reaction of fields growing alfalfa and the use of field tests in its determination, P. E. Karraker, R. Kenney, and H. F. McKenney (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 351–356*).—Comparisons of commercial soil acidity indicators in tests of the soil reaction in alfalfa fields in the northern bluegrass region of Kentucky are reported, the experiments having been made upon fields which had never been limed. Both Richorpoor solution and Soiltex, and litmus paper even more frequently, were found to give acid tests with surface soil in alfalfa fields with sufficient frequency to lessen materially their value for such purposes. The pH values of the soils tested, with one exception, lay within the range 6.0 and 7.6.

The lime requirement of acid soils; the slow reappearance of acidity after saturation with lime [trans. title], C. Brioux and J. Pien (*Compt. Rend. Acad. Sci. [Paris], 184 (1927), No. 25, pp. 1583–1585*).—Liming experiments are reported in which it was found that the indicated requirement of lime added to acid soils brought them to neutrality, but did not maintain them in that condition. The drop in pH value (hydrogen electrode) was usually appreciable after 24 hours, but sometimes remained but slight during 2 or 3 weeks. At the end of 8 months, however, all the soils tested, whether given the exact lime requirement or three times this quantity, had dropped to the extent of about 0.5 pH unit to about 1.5 pH units below the initial value produced by the liming. The data for three soils having a pH value before liming of 5.67, 6.35, and 6.15, respectively, are tabulated, showing the pH values 2 hours after liming and at further intervals of 24 hours, 1, 3, 7, and 8 weeks, and 5.5 months for one of the soils, and at somewhat similar intervals, concluding with a reading at the end of 8.5 months, for the other two soils. These data include the effect of supplying the theoretical lime requirement and that

of supplying three times this amount, the treatments in each case including both a calcium oxide treatment and the treatment of an equivalent quantity of calcium carbonate. As an explanation of the declining pH values noted, a slowly equilibrating buffer action is suggested, this action proceeding either from an oxidative formation of organic acids or from a very slow solution of unsaturated silicates in the soil.

Microbiological analysis of soil as an aid to soil characterization and classification, S. A. WAKSMAN (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 297–311*).—This paper presents a condensed review of this phase of soil study, the available and possible methods being considered, after a brief general introduction, under the following subheadings: Relative abundance of microorganisms in the soil, evolution of carbon dioxide, nitrifying capacity of the soil, cellulose-decomposing capacity of a soil, nitrogen fixation and development of Azotobacter, and the amount and nature of organic matter (humus) in the soil.

Though methods can not be standardized on the basis of knowledge at present available, and though but little is known of the influence upon the soil population of mechanical composition, physical and chemical condition of the soil, climatic and seasonal variations, and many other factors, and the soil population is so sensitive to nutritional and environmental conditions that an exact microbiological picture of given soil types may never be possible, yet the very fact of this sensitivity of the soil population to slight changes in soil conditions is considered to make a knowledge of the microbiological condition of soils a most valuable means of characterization. A bibliography of 29 titles is appended.

The microflora and the productivity of leached and nonleached alkali soil, J. E. GREAVES (*Soil Sci., 23 (1927), No. 4, pp. 271–302*).—Twelve pots of each of 3 natural alkali soils in which chlorides, sulfates, and sodium carbonate, respectively, were the predominating alkali salts, together with similar series of chloride-, sulfate-, or carbonate-treated productive calcareous silt loam, and series in which the nonalkali soil was treated with combinations of 2 and of all 3 alkali-producing salts were prepared and allowed 2 months in which to approach equilibrium; after which 6 pots of each series were leached under a constant head of water during a period of 640 days. The total numbers of bacteria were then determined, together with the ammonifying, nitrifying, and nitrogen-fixing power of both the leached and unleached soils. The productivity was tested by seeding 2 of the leached and 2 of the unleached pots from each series to crimson clover, by treating 2 of the leached and 2 of the unleached pots of each series with barnyard manure at the rate of 15 tons per acre and subsequently seeding to crimson clover, and by treating 2 of the leached and 2 of the unleached pots of each series with 50 cc. of soil extract made by shaking 100 gm. of fertile soil in 1,000 cc. of water, settling, and pipetting off 50 cc., after which treatment these pots also were seeded to crimson clover. The results and conclusions given are in part as follows:

Two per cent sodium chloride decreased the bacterial numbers 11 per cent, leaching producing an increase of 38 per cent over those of the normal soil. Two per cent sodium sulfate caused no difference beyond the experimental error between treated and untreated soils. Two per cent sodium corbonate reduced the bacterial numbers 24 per cent, and leaching increased them 830 per cent. Two per cent sodium chloride reduced ammonification to 10 per cent, sodium carbonate to 41 per cent, and sodium sulfate to 52 per cent of normal. Leaching in many cases increased the ammonification to more than that of a normal soil. A soil extract and manure were both effective in restoring ammonification in alkali soils. Sodium carbonate reduced nitrification to 7 per cent, sodium chloride to 12 per cent, and sodium sulfate to 47 per cent of

normal. Nitrification was very low even after leaching, but was increased by both soil extract and manure. Alkalies retarded the fixation of nitrogen in Ashby media, into which the soil was seeded. Nitrogen fixing organisms were found more resistant to soluble salts than other beneficial microorganisms. Leaching increased crop yield, and some of the alkali markedly increased the nitrogen content of the plants.

On the existence of daily changes in the bacterial numbers in American soil, H. G. Thornton and R. A. Fisher (*Soil Sci., 23 (1927), No. 4, pp. 253–259, figs. 4*).—This is a reanalysis of the data on daily bacterial counts in certain American soils of Smith and Worden (E. S. R., 54, p. 515), who drew from their results the conclusion that the difference between simultaneous samples was greater than any detectable fluctuation. The authors consider that the comparison of differences between individual simultaneous samples with daily changes in the mean of two samples is not valid, however, and they give calculated correlations and graphs of correlations and of daily fluctuations of the duplicate samples plotted individually, as showing that the American experiments indicate daily fluctuations as distinct as those found by Cutler and Crump (E. S. R., 45, p. 213) at Rothamsted.

Effect of cropping on the nitrogen and organic carbon of irrigated soils, H. V. Jordan (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 280–284*).—In contrast to many previously reported studies of the effect of cropping upon both humid and dry-farmed soils, it was found that the nitrogen and the organic carbon of Anthony gravelly sandy loam were not in any case decreased under a system of irrigation and continuous cropping to alfalfa during periods of 2, 3, 6, or 7 years. No significant differences were observed between the irrigated and cropped soil and the neighboring virgin soil after 2- or 3-year periods in alfalfa, but after the longer periods the continued growth of alfalfa with removal of the crop as hay had markedly increased both the nitrogen and organic carbon in the soil. This is attributed in part to the accumulation of leaves lost in harvesting, in part to increased root development under irrigation, and with respect to nitrogen, in large measure to symbiotic nitrogen fixation.

[Soil fertility studies of the Indiana Station], A. T. Wiancko et al. (*Indiana Sta., Soil Fertility Invest., Scottsburg Field, 1906–1924 and 1906–1925, pp. 4 each, fig. 1 each; Worthington Field, 1913–1924 and 1913–1925, pp. 4 each, fig. 1 each; Francisco Field, 1917–1924 and 1917–1925, pp. 4 each, fig. 1 each; Jennings Co. Field, 1921–1924 and 1921–1925, pp. 8 each, fig. 1 each; Soils and Crops Expt. Farm, 1915–1924 and 1915–1925, pp. 8 each, figs. 2 each*).—Further results of fertilizer tests (E. S. R., 52, p. 211) are reported, and recommendations are made for soils of the respective types.

[Soil and fertilizer experiments at the New Jersey Stations] (*New Jersey Stas. Rpt. 1926, pp. 225–228, 521–568, pl. 1*).—Work with soils and fertilizers during the year included the following, continuing earlier work (E. S. R., 57, p. 18):

The nature of cranberry bog peat, C. S. Beckwith, B. F. Driggers, and C. D. Jones (pp. 225–228).—A study of cranberry bog peats in which a decreasing productivity had been observed indicated a high acidity, as low as pH 3.02 in certain small areas, with a concomitant low microbiological population and low rate of decomposition of organic matter. This rate of decomposition, as measured by carbon dioxide evolution, was found to decrease with increasing water content from 45 per cent to saturation (70.2 per cent). The addition of calcium carbonate, dried blood, sodium nitrate, urea, and acid phosphate; of various proportions of sand, sand and calcium carbonate, and sand and ammonium phosphate; of additional organic matter in the forms of cellulose, straw, soy bean

meal, cellulose with calcium carbonate, and straw with calcium carbonate; and of ammonium sulfate and ammonium nitrate showed that an increase in the decomposition rate is not readily secured, and especially that nitrogen, though the carbon-nitrogen ratio of the peat soils studied was 20:1, is not the limiting factor for microorganismic activity in these cranberry bog peats.

The availability of nitrogen in nitrate of soda, ammonium sulfate, and dried blood, with varying ratios of phosphoric acid and potash, J. G. Lipman and A. W. Blair (pp. 521–528).—Constant amounts of nitrogen were provided from nitrate of soda, ammonium sulfate, and dried blood and also from a combination of these three, the effect upon nitrogen recovery in the crop and cylinder experiments of the use of single, double, and triple portions of phosphoric acid and of single and double portions of potash being studied. In general, two crops were used, fertilizer being applied for the first crop and the second crop grown to utilize any nitrogen not taken by the first. The results are summarized in part as follows:

"In 1925 rape was grown as the first crop and sorghum as the second. For the first crop the yields of dry matter and the percentages of nitrogen recovered with nitrate of soda, ammonium sulfate, and dried blood were, with slight exception, in the order named. With the double portion of potash the larger amounts of phosphoric acid caused a slight decrease in percentage of nitrogen recovered. With the single portion of potash the highest nitrogen recovery was with the triple portion of phosphoric acid and the next highest with the single portion. . . . In most cases the first crop recovered less than 50 per cent of the applied nitrogen. For the second crop there does not appear to be any direct relation between the nitrogen recoveries and the amounts of phosphoric acid and potash used. The dried blood gave relatively higher recoveries with this crop than with the first crop. For the combined crops the double portion of potash gave lower average yields and lower average recoveries than the single. Here also there does not appear to be any direct relation between the nitrogen recovered and the amount of phosphoric acid used. . . .

"The summary of the four years' work shows that the highest average recoveries were obtained with nitrate of soda. In nearly all cases the recoveries were less where the double portion of potash was used than with the single portion. From the four-year averages of all the crops and all the nitrogen treatments it would appear that the double and triple portions of phosphoric acid did not give sufficient increase in nitrogen recovery to justify their use."

[*Green manure crop and chemical fertilizer experiments*] (pp. 528–533).—In the plat experiments on the continuous growing of wheat and rye with and without a legume green manure crop, the green-manure plats did not respond materially to top dressings of 160 lbs. per acre of nitrate of soda, but in the plats without the legume green manure increases of nearly 5 bu. per acre of both wheat and rye resulted from the top-dressing applied in 1925.

From the experiments on the continuous growing of corn with a legume and with a nonlegume green manure crop, the conclusion was drawn that there is a distinct advantage in using a legume rather than a nonlegume cover crop, and that there is some advantage in using very small applications of manure with a green manure crop.

Results of experiments on the influence of chemical fertilizers on the composition and conservation of the soil, in which potatoes were grown, indicated that rapid changes in soil composition from the use of commercial fertilizers are not to be expected, and that great care must be used in collecting samples for chemical analysis.

The treatment of alkali soils with $AlPO_4$, J. S. Joffe and H. C. McLean (pp. 533–538).—A favorable influence of aluminum phosphate due to an immediate reduction of alkalinity has been established and appears to be of permanent effect, but this effect is not considered of sufficient importance to figure in a system of alkali-soil improvement. Cheap and readily available aluminum phosphate might be of advantage, however, in combination with sulfur, since the rate of sulfur oxidation was found greater in sulfur-plus-aluminum phosphate treated soils than in soils treated with sulfur alone. In this case "the aluminum phosphate may become a potential source of phosphorus."

Making artificial manure from salt marsh hay by the "Adco" process, H. C. McLean (pp. 538–540).—"It is no doubt true that good manure may be made from certain waste products by this process, but the expense of the process may be a limiting factor in this country."

Soil microbiology, S. A. Waksman (p. 540).—From a study of soil humus formation, it is concluded that humus consists of (1) an accumulation of certain resistant constituents (e. g. lignin) of natural organic materials, and (2) resistant compounds produced by microorganismic synthesis. Components of natural organic matter added to soils were decomposed in the order (1) soluble carbohydrates and proteins and (2) pentosans, celluloses, and various hemicelluloses and proteins. Lignins, cutins, and fats were found decomposed to a much lesser extent. Under favorable conditions, 80 per cent of the organic matter added to soils may be decomposed, with a loss of about 50 per cent of the carbon as gases, mostly carbon dioxide. Differences in the processes appear under anaerobic conditions, however.

[*Soil classification and utilization*], L. L. Lee (pp. 541–568).—The soil survey of the State was completed during the year, the findings including the identification and enumeration of 164 distinct types, 154 of which are comprised in 5 series, while the remaining 10 types are miscellaneous. The acreages of the various types are given in detail together with notes on their utilization. Notes on fertilizer experiments of the usual type in Burlington and Monmouth Counties, respectively, are appended.

Economic values of different forms and amounts of agricultural lime, J. W. White and F. J. Holben (*Pennsylvania Sta. Bul. 211 (1927), pp. 23, figs. 7*).—The three field experiments reported were carried out on 23 0.1-acre plats, on DeKalb, Volusia, and Westmoreland soils, representing together 71 per cent of the Pennsylvania soil area. The rotation has been corn, oats, wheat, and hay (clover and timothy). Two rotations have been completed on the Volusia and Westmoreland soils and 1.75 rotations on the DeKalb soil. The liming rates were (1) a sufficient amount to correct the soil acidity according to the Veitch lime requirement in terms of calcium carbonate, one application at the beginning of the experiment; (2) the equivalent of 800 lbs. of pure hydrated lime or 1,081 lbs. of limestone applied to the wheat crop only, and (3) the equivalent of 400 lbs. of pure hydrated lime or 540.5 lbs. of limestone applied to each corn and wheat crop. All the plats were uniformly fertilized.

The conclusions thus far drawn from the experiments are in part as follows: Pulverized limestone (20 mesh), hydrated lime, and ground burnt lime give similar results when applied in chemically equivalent amounts. On the basis of equal units of lime oxides, the smaller applications of limestone and hydrated lime gave approximately twice the crop yields in a 4-year grain rotation as did the heavier applications, the profit being 95.8 per cent greater for the smaller than for the larger rates. Practical recommendations based upon these conclusions are given.

The value of solubilized leather scrap used as a fertilizer [trans. title], G. JOBET and E. RADET (*Ann. Falsif., 20 (1927), No. 219, pp. 133–148*).—The experiments reported include analyses of leather scrap rendered soluble by thorough, by ordinary, and by poor methods of acid treatment, followed in each case by partial neutralization with phosphate of lime. Nitrogen soluble in water, nitrogen insoluble in water, and nitrogen soluble in neutral potassium permanganate solution were determined, together with soluble phosphates. Pot nitrification experiments were also made, in which the behavior of the very soluble, the moderately soluble, and the slightly soluble leather scrap preparations was compared with that of dried blood. On a calcareous soil, the nitrification rates in proportion to that of dried blood (taken as 100) were 87 for the very soluble leather scrap and 70.3 for the moderately soluble. On a clayey soil the most soluble leather scrap preparation gave a nitrification rate of 62.4, the moderately soluble 56.0, and the slightly soluble preparation 53.6. The value of this type of material as a nitrogenous fertilizer is regarded as somewhat doubtful.

AGRICULTURAL BOTANY

Report of the department of plant physiology, J. W. SHIVE ET AL. (*New Jersey Stas. Rpt. 1926, pp. 357–372, fig. 1*).—The papers noted below contain data on investigations which are in progress.

Effects of boron on the growth of Vicia faba in culture solutions, A. B. Fagundes (pp. 357–360).—In a preliminary report it is shown that boron exerts a decided influence on the development of both tops and roots of *V. faba*. It is strongly suggested that the effects of boron on the growth of the broad bean plant are due to or in some way accentuated by certain conditions inherent in the culture solution itself.

Absorption of nitrogen from culture solutions by plants, C. D. Jones and C. E. Skinner (pp. 360–365).—In work designed to show the actual and relative amounts of nitrogen withdrawn by plants during definite short intervals throughout the whole growth cycle from frequently renewed, balanced culture solutions containing both ammonium and nitrate ions, the results of which are tabulated, it appears probable, but is not yet certain, that both nitrate and ammonium nitrogen are utilized by soy beans under the conditions. Ammonium nitrogen is absorbed from solution throughout the life of the plant and at somewhat similar rates, nitrate nitrogen being absorbed from solution in quantities detectable by the method used only during the later stages of growth. Rapidity of development of the plants appeared to be a modifying factor. Corn plants used for comparison underwent a somewhat different course as regards changes in utilization of nitrogen. Absorption of ammonium nitrogen did not materially increase correspondingly with its concentration in the medium, but nitrate nitrogen increased markedly with increase of the nitrate content. It is, however, regarded as certain that the total complex of factors governing the removal of ions containing nitrogen from growth media by plants is as yet quite obscure.

The effect of different water levels on the growth of cranberries, B. F. Driggers (pp. 365–372).—Tabulated results of studies on cranberries, regarding the effects of different water levels on vegetative growth, yield and rot, are said to show some contrasts with results previously obtained, but best average vegetative growth under the conditions resulted in case of plats in which the water levels were held about 12 in. below the surface of the bog soil. Foliage on plats having the highest water level showed a distinct yellowish-red cast. The difference in yields with various water levels was even more pronounced, a water level of 6 in. or less below the soil surface showing a decidedly adverse influence upon both vegetative growth and yield.

The most noticeable effect of levels, despite the relatively dry season, showed in the amount of rot. It is thought that the excess moisture on the plats where the water levels were highest explains the high percentage of rot in these instances. Other supposed factors are discussed.

The evolution of substances in the plant world [trans. title], S. L. Ivanov (*Izv. Akad. Nauk S. S. S. R.* (*Bul. Acad. Sci. U. R. S. S.*), *6. ser., 1926, No. 5–6, pp. 355–362*).—The author cites a series of biochemical reactions of related plants showing that various chemical compounds develop in an evolutionary manner, and on the basis of his researches he formulates what is claimed to be a fundamental biochemical law. Each species under constant environmental conditions maintains a constant property of elaborating specific substances which serve as physiological chemical attributes. Each species shares strikingly its physiological chemical attributes with those species with which it is closely related genetically. The nearer the relation the richer are the species in such common attributes. As the relation becomes more distant there is a tendency for new substances to appear, which bear a comparatively simple chemical relation to the original substances. The physiological chemical attributes are thus evolutionary in nature. In related plants, series of chemical substances represent or reveal the paths of evolutionary development of the physiological chemical attributes.

The law of biochemical evolutionary development of plant substances opens up a new field and furnishes the basis of a method for investigations establishing the relations of plants according to their contained chemical substances, which basis is regarded as important in a systematic treatment of plants. It also throws some light on phytopathological investigations by showing the probable limits of spreading of parasitic fungi among groups. It suggests also investigations on the acclimatization of plants, and it may allow, in many cases, prediction as to where acclimatization would lead.

The influence of climate on the anatomical structure of wheat plants and on the gluten content of the grain [trans. title], J. Halmy (*Pflanzenbau* [*Berlin*], *3* (*1926*), *No. 5, pp. 77–79*).—Wheat varieties, considered individually, adapt themselves in marked degree, both chemically and anatomically, in response to changed climatic relationships; but adaptive characters so developed do not necessarily persist long under changing local conditions. The author designates among dry-land wheats those which are indicated as I-, II-, and III-xerophytic subdivisions.

Seed and plant stimuli, particularly with magnesium salts [trans. title], Gisevius, Bringmann, and Strair (*Pflanzenbau* [*Berlin*], *3* (*1926*), *No. 5, pp. 65–70*).—The authors, working along the lines marked out by Popoff of Bulgaria, have made use of magnesium chloride, magnesium sulfate, and calcium sulfate as stimulants in connection with winter and summer barley, rye, winter wheat, beet, pea, and oat, and have presented their findings in tabular detail with discussion. It is thought that no high degree of certainty as regards results can yet be attained in the use of chemically stimulating substances with plants on the soils used.

Tobacco seed germination in its relation to light [trans. title], W. Busse (*Ztschr. Bot., 18* (*1925*), *No. 2, pp. 65–87*).—Results are tabulated of experiments with seed of a number of tobacco varieties tested both in light and in darkness as to germination, with discussion of this and of related work.

Studies regarding the Weber-Fechner law and the law of resultants in phototropism [trans. title], E. G. Pringsheim (*Ztschr. Bot., 18* (*1926*), *No. 5, pp. 209–254, figs. 5*).—The studies herein reported as carried out on coleoptile phototropism in pure-line cereals (*Avena sativa*, *Hordeum vulgare*, *Secale*

ale, Triticum sativum), *A. elatior*, and (for comparison) *Brassica napus*, said to show that the Weber-Fechner law (E. S. R., 47, p. 128) applies in totropism, and that the law of resultants holds in phototropic flexures.

Water evaporation in moving air and its relation to the area of the face [trans. title], H. WALTER (*Ztschr. Bot.*, *18* (*1925*), *No. 1*, *pp. 1–47*, *. 5*).—Studies in evaporation, using pasteboard models of regular geometrical ms or else of the forms of leaves (*Aristolochia sipho* and *Vitis vinifera*) are d to show that evaporation in moving air is not proportional to superficial a, and that the form of the surface and the direction of the wind both luence the results. A section on the mathematical phases of the subject is ntributed by O. Treitel.

Contributions to the knowledge of abscission and exfoliation of floral gans, I. NAMIKAWA (*Jour. Col. Agr., Hokkaido Imp. Univ.*, *17* (*1926*), *No. 2*, *. 63–131, figs. 20*).—This account, with a bibliography, deals in systematic :m and in tabular detail with studies on the abscission of catkins in *Alnus ponica*, *A. hirsuta*, *Corylus sieboldiana*, *Betula japonica*, *Salix jessoensis*, *S. rida* and other species, *Populus maximowiczii*, and *Castanea pubinervis*; the foliation of floral organs in Liliaceae, Amaryllidaceae, *Iris setosa*, *Cucumis tivus*, *Menyanthes trifoliata*, *Platycodon grandiflorum*, and *Ribes grossularia*; motic pressure in catkins of *A. japonica*, *A. hirsuta*, *C. sieboldiana*, and *S. rida*; and osmotic conditions of floral leaves.

The shedding of floral organs may be associated with abscission, exfoliation, no apparent change in the floral organ. In all catkins examined a more or ss differentiated separation zone was observed at the base of the stalk, though is was very slight in Corylus. The cells in any well-differentiated separation ne are small and isodiametric, and they show rich plasmatic contents. echanical cells, as bast fibers or stone cells, are nearly or completely lacking in is zone. In Alnus and Corylus the phloem in the vascular bundles of the ower branch and catkin axis develops in larger proportion than in the vegetave shoot or in the axis bearing the flower branch.

A separation process takes place in a separation layer which is formed in he separation zone. The separation is brought about by the dissolution of the middle lamellae or of the middle and secondary lamellae of cell walls, rapid nlargement of separation cells, and an increase in their osmotic pressure. The mechanical cells in the vascular bundles are broken mechanically after the eparation process has reached to a certain stage. Plasmatic contents, starch grains, and oil droplets usually increase in the separation layer before separation occurs. Abscission takes place in all the catkins examined except the fertilized female catkin of Alnus. After the abscission or exfoliation, the tracheidal elements in the scar or in the tissue which undergoes the change are blocked with a gumlike substance. Formation of tyloses is rare.

In all catkins examined the osmotic pressure in the separation zone and separation cells becomes remarkably high before separation occurs. Osmotic fluctuation is in close relation with the degree of growth and with the change in dry weight of the floral leaf. Petal growth is very slow after the flower has opened. Dry weight and osmotic pressure decreased together before defloration.

Alterations in plants following castration [trans. title], V. G. TARANOVSKAIA (W. G. TARANOWSKY) (*Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *23* (*1927*), *No. 2*, *pp. 127–164, fig. 1*; *Ger. abs.*, *pp. 162–164*).—An outstanding result, on the practical side of this research, is that castration of the plants used tends to a higher production of total dry matter, also to higher percentage production of nutritive values. Nitrogen, sugar, and phosphoric acid were increased, and cellulose decreased. It is asserted, also, that general increase or improvement

resulted in useful substances or qualities, as sugar, earliness of ripening, and bearing capacity.

The tumors of resiniferous trees [trans. title], J. Dufrénoy (*Rev. Path. Vég. et Ent. Agr., 12 (1925), No. 2, pp. 102–112*).—A study of tumefactions in Aleppo pine and other resiniferous trees is outlined with statements and discussion as to bacteria present, modifications, and products. The tumor as a whole has a sort of individual life, sustaining with the stem or branch relations somewhat comparable with those between fruit and branch, or more like those between tuber and stolon. The tumefactions are complex, comprehending tissues which accumulate tannin, which act as reserve, or which show active hyperplasia.

The rôle of endophytic fungi in orchid culture [trans. title], J. Magrou (*Rev. Path. Vég. et Ent. Agr., 12 (1925), No. 2, pp. 180–184*).—Referring to recorded facts and opinions, the author holds on the basis of his own presentations that the proved germinability of orchid seeds without fungi on concentrated solutions does not disprove that fungi can be dispensed with for germination under the condition of weak media, which seems to be usual in a state of nature.

Culture methods for orchids [trans. title], J. Wolff (*Rev. Path. Vég. et Ent. Agr., 12 (1925), No. 2, pp. 185–190*).—In the main, the author deals with data or views regarding symbiosis in orchid culture.

Plant names, F. E. Romine (*Pontiac, Mich.: Author, 1926, pp. [7]+115*).—This booklet gives in alphabetical order the common or vernacular, also the scientific or botanical, plant names, with some characters.

GENETICS

Age of pollen and other factors affecting Mendelian ratios in maize, J. H. Kempton (*Jour. Agr. Research [U. S.], 35 (1927), No. 1, pp. 39–74, figs. 2*).—This contribution from the U. S. D. A. Bureau of Plant Industry presents data regarding modifications in Mendelian ratios in corn. The genes involved were the *C* c pair (aleurone color) and *Wx wx* (horny v. waxy endosperm). See also a previous note (E. S. R., 57, p. 29).

The ratio of waxy to nonwaxy bearing gametes did not appear to be invariably lower in the male gametes. The percentage of waxy seeds was alike on upper and lower ears in back crosses where the male parent was heterozygous for the *Wx* gene, whereas where the female parent was heterozygous the percentage was higher on the upper ears. No difference was apparent in the percentage of waxy seeds on the butts and tips of the ears, nor did long styles seem to be associated with a low percentage of waxy seeds. Gametes bearing the genes *su* and *wx* seemed no less effective than those with other combinations of these genes.

Storage of pollen in daylight for about 7 hours greatly increased the proportion of functioning gametes bearing the *wx* gene, although storage for longer periods at night (14 to 16 hours) seemed to have little effect upon the proportion of *wx* to *Wx*. Pollen storage increased the proportion of gametes bearing the aleurone gene *c*, but to a less degree than for *wx* and slightly altered the crossover ratio of these two genes. Although pollen storage increased the proportion of *wx* to *Wx* and of *c* to *C* bearing gametes to above equality, the proportion of these genes in fresh pollen is said to be below equality. Indirect evidence suggested that gametes bearing either the *wx* or *c* genes mature at a slower rate than those bearing the dominant allelomorphs.

Differential action of the sugary gene in maize on two alternative classes of male gametophytes, R. A. BRINK and C. R. BURNHAM (*Genetics, 12 (1927), No. 4, pp. 348–378, figs. 6*).—Tests at the Wisconsin Experiment Station of the relationship apparently existing between sugary and waxy genes in corn in modifying the waxy ratio (E. S. R., 57, p. 121) led to the conclusion that the large deficiency in the waxy class results only when the waxy heterozygote employed as the pollen parent is homozygous for the sugary gene. The sugary gene in heterozygous condition in the staminate individual does not lower the waxy ratio. Since the composition of the pistillate parent with respect to the sugary gene does not influence the waxy ratio obtained, the sugary gene in the homozygous condition apparently exerts a differential action on waxy and nonwaxy pollen only, which occurs independently of any similar or complementary condition in the style of the plant. An hypothesis advanced is that the cytoplasm contributed by the sporophyte to the microspores differs in sugary and nonsugary plants, and that for some reason unknown at present waxy gametophytes receiving sugary type cytoplasm are handicapped in development.

Hereditary adiposity in mice, C. H. DANFORTH (*Jour. Heredity, 18 (1927), No. 4, pp. 152–162, figs. 8*).—Data are presented from experiments conducted at Stanford University which show that the factor for yellow in mice is itself responsible not only for color and the lethal effect when homozygous but also for an increased tendency to fatten, or that genes for the three effects are so closely linked that no crossing-over has been observed between them. It was found that albinos carrying the yellow gene also showed the tendency to fatten. When placed on deficient diets the yellow mice were able to survive longer, no doubt due to the storage of the necessary food substances. It is pointed out that the tendency to obesity does not become apparent until after sexual maturity, and that the curve of growth for the yellow females closely resembles that of ovariectomized mice.

Evolution of the chondriome during the formation of pollen grains in the angiosperms [trans. title], N. WAGNER (*Biol. Gen., 3 (1927), No. 1–2, pp. 15–66, pls. 2, figs. 2*).—This is a contribution in French from the Institute of Vegetable Physiology of Charles University at Prague.

A genetic study of certain chlorophyll deficiencies in maize, W. A. CARVER (*Genetics, 12 (1927), No. 5, pp. 415–440, fig. 1*).—Investigation at the Iowa Experiment Station was concerned with the genetic relations between several chlorophyll defects and certain other plant and kernel characters in corn. A virescent seedling type of corn, distinctly carotinoid in appearance, proved to be inherited independently of the factors *Y*, *C*, *R*, and *Wi*. Factors for this virescent and for white-base leaf (*wl*) produced in F_2 a ratio of 9 green seedlings, 3 white-base leaf, 3 virescent, and 1 albino seedling, the latter being of the genotype *wl wl v v*. The seedling type, rolled (*ro*), an abnormality of the leaves and underground parts, was found to be strictly Mendelian in inheritance.

According to data presented, the factor for rolled is independent of *Am*, *Su*, *Lg*, and one virescent factor. Two virescents designated as v_6 and v_7 were found to be linked to *Y* with a crossover percentage of 23 and 38, respectively. A crossover percentage between v_6 and v_7 of about 42 indicated that these factors are located on opposite ends of the chromosome. Linkage between *Su* and *Wl* was indicated with between 20 and 22 per cent of crossing over suggested.

The inheritance of heterostyly in Lythrum salicaria, E. M. EAST (*Genetics, 12 (1927), No. 5, pp. 393–414*).—This contribution from the Bussey Institution shows that trimorphism in *L. salicaria* is due to three factors. The long-styled plant was the ultimate recessive. The mid-styled plant was due to duplicate

factors in the same linkage group having a crossover value of about 10 per cent, these factors being lethal when in the homozygous condition. Mids most commonly found had the constitution $\frac{MaMb}{mamb}$. Mids $\frac{Mamb}{mamb}$ were also tested in numerous combinations. The short-styled plants were found to be conditioned by an independent factor *A* and may or may not carry the factors that condition mid. There was some evidence that crossing over is slightly less in the female than in the male.

Extra toes in the guinea-pig: An atavistic condition and its genetic significance, C. R. STOCKARD (*Anat. Rec., 35 (1927), No. 1, p. 24*).—A brief account of selection experiments at the Cornell University Medical School, in which a five-digit front-footed guinea pig has been produced, is given. This is assumed to be a return to the ancestral condition. It is concluded that the germinal basis for the five digits is still present in the animals, although unexpressed in racial evolution for long generations. In these experiments the mating of animals with only perfectly developed extra toes has produced offspring all of which show extra toes of various degrees of perfection.

Mendelian inheritance of chromosome shape in Matthiola, M. M. LESLEY and H. B. FROST (*Genetics, 12 (1927), No. 5, pp. 449–460, figs. 4*).—Studies at the University of California and the Citrus Experiment Station at Riverside, Calif., show the Snowflake variety of garden stock to have, as compared with other varieties, chromosomes of unusual length at the late prophase and the metaphase of the first meiotic division in the pollen mother cells. Abnormal chromosome behavior, frequently observed in the pollen mother cells of the long chromosome race, is believed to be due possibly to the attenuation of the chromosomes. Normal plants of the long chromosome variety produce several per cent of trisomic progeny of at least eight kinds, in three of which the extra chromosome is clearly a fragment of a normal one.

[Chromosome production in Oenothera lamarckiana], K. BOEDIJN (*Ztschr. Bot., 18 (1926), No. 4, pp. 161–171*).—In the progeny of *O. lamarckiana semigigas*, plants (mutants) may occur having any chromosome number between 14 and 21. About half of these have 15, while the other numbers become rarer as they become higher. Excepting *O. semigigas* and *O. gigas*, about half the mutants which have sprung immediately from *O. lamarckiana* have 14 chromosomes, the remainder 15. The question arose whether higher numbers might be abnormal and hereditary.

It was found, as a result of breeding experiments with progeny of *O. semigigas*, that those forms which have 14 or 15 chromosomes gave progenies in which these numbers regularly repeated. Mutants having 16 or 17 chromosomes, however, after self-fertilization returned to the chromosome numbers 14 and 15. The production of these higher numbers is, therefore, regarded as a transitory phenomenon.

The distribution of a monohybrid characteristic in a population and in relation to the genes [trans. title], J. V. HULTKRANTZ and G. DAHLBERG (*Arch. Rassen u. Gesell. Biol., 19 (1927), No. 2, pp. 129–165, figs. 8*).—The author has calculated formulas to indicate the make-up of offspring of populations of various compositions based on the percentage and types of gametes produced.

The fundamentals of cell growth and cell division and of heredity and sexuality, V. SCHIFFNER (*Die Existenzgründe der Zellbildung und Zellteilung, der Vererbung und Sexualität. Jena: Gustav Fischer, 1926, pp. V+180*).—This is a discussion of the mechanism of cell division and the physical basis of heredity and sex determination.

Abnormal sexuality in animals.—II, Physiological, F. A. E. Crew (*Quart. Rev. Biol., 2 (1927), No. 2, pp. 249–266, figs. 4*).—In continuing this series of studies (E. S. R., 56, p. 224), cases of physiological modifications in the sex of animals are discussed, referring among others particularly to the freemartin, the reciprocal freemartin in the opossum, sex determination in Bonellia, parasitism in Inachus, Sacculina, and *Thelia bimaculata*, gonadectomy in fowls, and temperature and other external influences in the oyster and limpet.

The effect of follicular extract on the generative organs of hysterectomized guinea pigs, L. Loeb and W. B. Kountz (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 7, pp. 728–731*).—A preliminary report is given of investigations at the Washington University School of Medicine, in which guinea pigs were hysterectomized at about 3 to 5 days following the heat period and injected for from 10 to 14 days with 2 or 3 daily doses of 1 cc. of follicular extract. It is explained that the removal of the uterus causes retention and continued functioning of the corpus luteum. The injection of the follicular hormone in these hysterectomized animals caused very little of the effect observed in normal animals, such as opening of the vagina, proliferation of the vaginal epithelium, etc. These results are explained as due to the suspension of the sexual cycle as a result of the presence of corpora lutea, which prevent ovulation but not the growth of follicles. The follicular hormone does not accelerate but seems to inhibit ovulation. It is concluded that this investigation substantiates the interpretation of the mechanism of the sexual cycle in that it consists of two different phases, and that in the regulation of the cycle there is a complex interaction of two or more substances derived from the corpora lutea as well as the follicles.

Sources of stimuli regulating the growth of the mammary glands in the opossum, C. Evers and C. Hartman (*Anat. Rec., 35 (1927), No. 1, p. 11*).—Investigations conducted at the Carnegie Institution of Washington indicate that the mammary glands develop in pseudopregnancy as in pregnancy and that hysterectomy does not appear to influence such development. It appears that the placenta, fetus, and uterus are not necessary factors, though human placenta is capable of causing pseudopregnant changes. The secretions of the Graafian follicles stimulate mammary development, and if ovulation fails to occur the follicles are nevertheless capable of continuing the growth of the mammary gland beyond the prooestrous stage. Ovariectomy in the dioestrum stage prevents the recurrence of another cycle, but when performed one or two days after ovulation it failed to inhibit the pregnant or pseudopregnant changes in the gland.

***Menstruation without ovulation in Macacus rhesus: Account of an experiment*, C. Hartman** (*Anat. Rec., 35 (1297), No. 1, p. 13*).—A case is briefly described of a monkey at the Carnegie Institution of Washington which menstruated without ovulation. This is assumed to be due to excessive ovarian secretion from cystic follicles when the secretion was stopped by laparotomy.

The oestrous cycle in the dog, I, II, H. M. Evans and H. H. Cole (*Anat. Rec., 35 (1927), No. 1, pp. 10, 11*).—Abstracts of two studies are given.

I. *The vaginal smear*.—Studies of bitches during the oestrus cycle indicated that during prooestrum there were many large, flat cornified cells free in the vaginal lumen, with increased numbers of epithelial cells, leucocytes, and erythrocytes as prooestrum progressed. During oestrum of 7 to 10 days, cornified cells and erythrocytes only appeared except for small epithelial cells and leucocytes during the last day or two. In metoestrum, lasting 30 to 40 days, small epithelial cells predominated except for the remains of the cornified cells and large numbers of leucocytes during the first few days.

II. *Coincident changes in the genital organs.*—During the oestrous period the two- or three-cell layered cylindrical epithelium of the vaginal mucosa grows into a stratified squamous structure. This is reduced during oestrum by the desquamation of the stratum corneum, which reverts to a low cylindrical structure in pregnant and nonpregnant animals in metoestrum. An endometrial cycle was likewise observed. Ovulation usually occurs at the end of the first day of true oestrum.

Biochemical studies of human semen and the mucin of the cervix uteri, I, R. KURZROK and E. G. MILLER, JR. (*Soc. Expt. Biol. and Med. Proc.*, *24* (*1927*), *No. 7, pp. 670–672*).—The results of experiments are reported, which indicate that semen contains an enzyme which acts as a solvent of the mucin in the cervix, thus aiding the spermatozoa in their passage into the uterus.

Is the supposed long life of the bat spermatozoa fact or fable? C. HARTMAN and W. K. CUYLER (*Anat. Rec.*, *35* (*1927*), *No. 1, p. 39*).—Observations on the genital tracts of two species of bats indicate that in the house-inhabiting *Nyctinomus mexicanus* there are no spermatozoa in the uterus of the female or in the testis of the male except during the limited breeding season in March. The female of the cave-inhabiting *Myotis* sp. harbors live spermatozoa throughout the winter, and the male also have live spermatozoa in the epididymis. It is concluded as more logical to assume repeated coitus throughout the winter as the explanation for the presence of spermatozoa in the uteri of the latter species than the supposed long life of the germ cells.

Distribution of foetuses in the uteri of mice, C. H. DANFORTH and S. B. DE ABERLE (*Anat. Rec.*, *35* (*1927*), *No. 1, p. 33*).—A brief account of the position and distribution of 2,625 fetuses in 419 mouse uteri is presented. The number of young in a single cornu ranged from zero to nine, and the distribution between the two horns of the uterus followed the laws of chance closely, indicating that the two sides are not independent. The observed relations are explained on the basis of an imperfect alternation of function where the organism contributed an impulse adequate for the maturation of a definitely limited number of ova, so that if more developed in one ovary there would necessarily be less in the other. This is in conformity with the compensatory increase of function observed following the removal of one ovary.

Weight of mouse embryos 10–18 days after conception, a logarithmic function of embryo age, E. C. MACDOWELL and E. ALLEN (*Soc. Expt. Biol. and Med. Proc.*, *24* (*1927*), *No. 7, pp. 672–674*).—A preliminary account is given of investigations at the Carnegie Institution dealing with weights of mouse embryos from 10 to 18 days after conception. The weight of the embryos during this period was found to be a logarithmic function of age when the embryonic age was considered as 7 days less than the conception age, the calculated formula being

$$\log W = 3.656 \log (t-7) + \log 0.000188,$$

in which W is the weight and t the conception age. The formation of the proembryo is considered to require about 7 days, as the primitive streak does not appear until about this time. The chick at the beginning of incubation was found to be comparable to the mouse embryo 7 days after conception, and on this basis showed a similar rate of growth. Treating other data graphically by the same method gave a fair indication of the time when the primitive streak stages are reached in the guinea pig, rat, and man.

Hormone content of the placenta and chorionic membranes, E. ALLEN (*Soc. Expt. Biol. and Med. Proc.*, *24* (*1927*), *No. 6, pp. 608–611*).—Preliminary tests have been made at the University of Missouri of the various tissues of pregnancy in different mammals to determine quantitatively their content of the

hormone which induces the cyclic oestrous changes in spayed rats. Positive tests have so far been recorded from the human in placentas at term, two chorionic vesicles from ectopic pregnancies of less than two months, and uterine material showing placental structures; from the cow cotyledonary placentas, full-term afterbirth, and maternal and embryonic parts of the cotyledons; and full-term chorions from the horse. So far, tests of chorions taken during the last half of gestation and extracts of mucosa stripped from the uteri of the sow, zonular placentas of dogs and cats during the latter half of gestation, rat placentas late in gestation, and tissue from chicks during incubation have all given negative results.

A gynandromorph mouse, C. H. DANFORTH (*Anat. Rec.*, *35* (*1927*), *No. 1*, *p. 32*).—A mouse having a well-developed left ovary, with large follicles and abundant liquor folliculi, normal uterine tube and left cornu, a right testis showing all early stages of spermatogenesis with a few mature spermatozoa, and a normal right ductus deferens and seminal vesicle is described from Stanford University. The relations of the urethra and vagina are aberrant with a few prostatic ducts on the female side.

FIELD CROPS

Agricultural manual.—Plant production, G. KRAFFT, rev. by C. FRUWIRTH (*Lehrbuch der Landwirtschaft. Die Pflanzenbaulehre. Berlin: Paul Parey, 1927, vol. 2, 13.–14 ed., rev., pp. VIII+335, pls. 13, figs. 287*).—This is a revised edition of the book noted earlier (E. S. R., 28, p. 826).

Some values of the statistical method in plat work, J. P. JONES (*Jour. Amer. Soc. Agron.*, *19* (*1927*), *No. 7*, *p. 675*).—Data from tobacco experiments showed that from 4 to 19 plants were needed to measure a 10 per cent difference in tobacco. Where sorting is done and records made on the small segregates the plat size should not be reduced below $\frac{1}{40}$ acre. From 3 to 6 plats were required to measure a 10 per cent difference in the 1924 and 1925 tobacco crops at the Massachusetts Experiment Station. From the viewpoint of probable error and mechanical manipulation the long, narrow plat seemed preferable. The pairing method of Student has been satisfactory at the station for the differences to be measured with tobacco.

Influence of border rows in variety tests of small grains, H. W. HULBERT and J. D. REMSBERG (*Jour. Amer. Soc. Agron.*, *19* (*1927*), *No. 7*, *pp. 585–589*, *figs. 2*).—Investigations on variety tests of winter and spring wheat, barley, and oats, and on rate and date of seeding trials of winter and spring wheat at the Idaho Experiment Station involved 14-row plats 7 ft. wide and 155.6 ft. long ($\frac{1}{40}$ acre) and separated by a 2-ft. alley. Including the yields of rows numbered 1, 2, 13, and 14 in the plat yields resulted in a considerable increase over the yield of the 10 interior rows, which were considered more nearly representative of the true plat yield. The data indicated that the rank as well as the actual yields of varieties or cultural methods may be incorrect when border rows are included in the calculation of plat yields. Removal of or correction for border rows in experiments seems necessary under western conditions.

Seeds mixture problems, R. G. STAPLEDON, W. DAVIES, and A. R. BEDDOWS (*Welsh Plant Breeding Sta., Aberystwyth, [Bul.], Ser. H, No. 6 (1923–1926), pp. 70, pls. 2, figs. 5*).—Plat and field trials with forage grasses and clovers, pure and in mixtures, had to do with soil germination and seedling and plant establishment, with particular reference to the effects of environmental and agronomic factors.

The evidence brought forward shows that poor soils and high elevations require increased seed rates, i. e., reduced number of species and seeding the appropriate species heavily, so arranging the mixture as to give the species which promise to become the ultimate dominants the earliest possible opportunity of assuming their legitimate position.

A suggested relation between water requirement of crops and their value in the rotation, H. Wenholz (*Australasian Assoc. Adv. Sci. Rpt., 17 (1924), pp. 674–676*).—"Briefly, the relation that appears to exist is that crops which have a high water requirement have a comparatively beneficial effect on the subsequent crop, and vice versa, that crops which have a relatively low water requirement have a comparatively detrimental effect on the succeeding crop. In other words, the higher the water requirement of the change crop used in the rotation the better the yield of the subsequent main crop which immediately follows it."

Legumes and grasses in crop rotation, T. L. Lyon (*Jour. Amer. Soc. Agron., 19 (1927), No. 6, pp. 534–545*).—A survey of experiment station activities, reported since the review by Pieters[1] and concerned with the effect of legumes, grasses, and green manures on the yields of succeeding crops, showed that with few exceptions experiments in the humid portions of the country have demonstrated the superiority of red clover and alfalfa over timothy in their effect on the yields of crops that follow. The beneficial effect of clover seemed due to its property as a legume. At eight stations in humid regions a greater effectiveness of legumes as compared with nonlegume green manures on the yields of succeeding crops was indicated on the soils used. A practical advantage seemed to be gained by the succeeding crop from replacing oats and possibly corn by soy beans, especially when the rotation omitted clover. In some trials a larger crop resulted after mixtures of corn and soy beans and oats and field peas than after either cereal alone. The dry farming region seemed the only part of the country in which legumes did not affect favorably the yield of the next crop with fair certainty, apparently because of lack of soil moisture.

New species of grasses from Central America, A. S. Hitchcock (*Biol. Soc. Wash. Proc., 40 (1927), pp. 79–88*).—Seventeen new species are described and seven new binomials are included.

The development of bast and leaf fibre cultivation in the British Empire, E. Goulding (*Jour. Textile Inst., 18 (1927), No. 4, pp. P83–P98*).—The production status of flax, hemp, sunn hemp, jute and its substitutes, ramie, manila hemp, banana and plantain fibers, sisal, Mauritius hemp, New Zealand hemp (*Phormium tenax*), bowstring hemp (*Sansevieria* spp.), and miscellaneous leaf fibers is indicated for divisions of the British Empire.

[Agronomic work in Idaho in 1926] (*Idaho Sta. Bul. 149 (1927), pp. 17–20, 31, 32, 42, 44–49*).—Further experiments (E. S. R., 55, p. 825) reported on from the station and substations comprised varietal trials with winter and spring wheat, oats, barley, flax, field and garden peas, potatoes, alfalfa, sweet clover, red clover, and vetch; planting tests with winter and spring wheat, oats, barley, corn, field peas, and potatoes; trials of nurse crops with legumes; drill calibration studies (E. S. R., 57, p. 528); and crop rotations.

Thin stands, not more than one plant per square foot, and utilization of the first growth seemed necessary for success with alfalfa for seed. A nurse crop depressed the second season's yield considerably, early pea varieties being more

[1] Green manuring: A review of the American experiment station literature, A. J. Pieters. Jour. Amer. Soc. Agron., 9 (1917), Nos. 2, pp. 62–82; 3, pp. 109–126; 4, pp. 162–190.

desirable as a nurse crop than any small grain. Gypsum applied to alfalfa at the station gave negative results, whereas substantial increases were made therewith at Winchester and Sandpoint. Cultivating alfalfa after the first cutting at Sandpoint did not increase the yield materially and lowered the value and appearance of the hay.

Application of barnyard manure as top-dressing to bluegrass pastures in the spring made it possible at the Caldwell Substation to maintain good pastures with moderate quantities of irrigation water. Top-dressed pastures lightly irrigated produced forage more abundantly than the more heavily irrigated but untreated pasture.

[Agronomic experiments in New Jersey], J. G. LIPMAN, G. W. MUSGRAVE, and L. G. SCHERMERHORN (*New Jersey Stas. Rpt. 1926, pp. 30, 31, 75–84, 303, 305, 308*).—The progress of variety tests with winter and spring wheat, oats, barley, rye, soy beans, and alfalfa, source of seed tests with potatoes, alfalfa, and red clover, trials of timothy strains, seeding tests with potatoes, and fertilizer trials with sweet potatoes and bent grass is outlined as heretofore (E. S. R., 56, p. 32).

Results of cooperative experiments with the U. S. Department of Agriculture indicated that when potatoes are planted in New Jersey as a late crop and measures necessary for the elimination and control of diseases are used the tubers produced are as vigorous for seed purposes as those grown in States farther north. Data from seeding tests suggest that closer spacing than normal would not greatly increase the percentage by weight of tubers in the smaller classes.

[Agronomic investigations] (In *Forschungsarbeiten aus der Landwirtschaftswissenschaft. Festschr. 70. Geburtst. Wilhelm Edler. Berlin: Paul Parey, 1925, pp. 29–45, 136–153, 177–230, figs. 21*).—These pages embrace contributions the translated titles of which are as follows: Self-fertility and the Effect of Inbreeding in the Beet, by C. Fruwirth (pp. 29–45); The Significance of the Seeding Rate and Spacing in Varietal Tests, by Schulze (pp. 136–153); The Results of 12 Years' Selection in Wheat, by Sessous (pp. 177–204); Topping and Spacing Tests with Corn, by J. Wacker (pp. 205–218); The Three Broad Leaved Fescues, *Festuca pratensis*, *F. arundinacea*, *F. gigantea*, and the hybrid *F. gigantea* × *pratensis*, by L. Wittmack (pp. 219–225); and The Relations Between Barley Varieties Determined by Means of Recent Serological Tests, by Zade (pp. 226–230).

Report of the [Danish] State Plant Culture Committee for the fiscal year 1926–27 [trans. title] (*Beret. Statens Planteavlsudv. [Denmark], 1926–27, pp. 143*).—This customary annual report contains a list of the Danish experiment stations, with brief notes on their location, acreage, and soil types, a description of the organization of the experimental work of the country, a review of the activities of each station for the past year, and a summary of the expenditures for 1926–27 and of the budget for 1927–28. A complete list of the publications of the stations is appended.

Alfalfa variety tests [trans. title], N. SYLVÉN (*K. Landtbr. Akad. Handl. och Tidskr., 66 (1927), No. 3, pp. 269–280*).—The results of variety tests with alfalfa originally inaugurated by the Royal Agricultural Academy and continued in 1926 by the Swedish Seed Association in five different localities are reported and discussed. The varieties under test were Grimm II, Grimm I, Cossack, Ultuna, Franconian, and Hungarian. In total yield Grimm II, Cossack, Ultuna, and Franconian did not show very great differences. Grim II, also designated as Lyman Original Grimm, was regarded as the most promising variety for the conditions under which it was grown. In contrast to Grimm II, Grimm I ranked lowest in yielding capacity.

The growing of lucerne (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Conferences, No. 1 (1926), pp. 32*).—This report of the conference on alfalfa culture (E. S. R., 55, p. 434) includes papers on The Spread of Lucerne Growing, by J. Russell; Lucerne Inoculation Trials, by H. G. Thornton; Some Scottish Experiments with Lucerne, by A. Cunningham; Lucerne for the Dairy Farm, by J. Mackintosh; and Lucerne Growing in High and Wet Districts, by R. D. Williams.

A comparison of selections of Coast barley, V. H. FLORELL (*Jour. Amer. Soc. Agron., 19 (1927), No. 7, pp. 660–674, fig. 1*).—Selection experiments by the U. S. D. A. Bureau of Plant Industry in California have produced a strain termed "Atlas" from Coast barley. Considering its yield, earliness, plumpness of kernel, and resistance to lodging, Atlas is held an improvement on this common California barley. The methodology in selection experiments with cereals is commented on.

The spineless cactus (*Rural New Yorker, 86 (1927), No. 4958, p. 927*).—The merits and status of the spineless cactus in Colorado, Arizona, and California are indicated briefly by statements from the experiment stations of those States.

Propagating red clover by cuttings [trans. title], N. SYLVÉN (*Sveriges Utsädesför. Tidskr., 37 (1927), No. 2, pp. 107–120, figs. 10; Eng. abs., p. 120*).—Experiments at Svalöf showed that red clover can be propagated by cuttings with practically the same success as alfalfa (E. S. R., 55, p. 735.) The results suggest cuttings with a single node, taken before stalk growth ceases and lignification of the lower part of the stalk hinders development of adventitious roots at the base of the cutting. Cutting off flower shoots, starting the cuttings in a hot bed, and early transplanting into the open are said to help to secure vigorous, cold-resistant plants.

Relation of endosperm character in corn to absorption of hygroscopic moisture, H. W. ALBERTS (*Jour. Amer. Soc. Agron., 19 (1927), No. 7, pp. 590–595, fig. 1*).—Based on the weight of corn at the beginning of a test at the Illinois Experiment Station, floury kernels of Reid Yellow Dent Corn absorbed more water in humid air and lost more in dry air than horny kernels during each 3-day period for the first 12 days. Thereafter floury corn weighed about the same as horny corn at the end of 3-day periods in humid air, but less in dry air. The change in weight of floury corn for a 3-day period was about 10 per cent greater than that of horny corn.

Hill fertilization studies on the utilization of the phosphorus in acid phosphate by corn, H. J. HARPER, W. G. BAKER, and B. and J. L. BOATMAN *Soil Sci., 24 (1927), No. 1, pp. 9–15*).—A study made by the Iowa Experiment Station on 6 different soil types in 8 counties dealt with the utilization of the phosphorus in acid phosphate by corn plants fertilized in the hill with 16 per cent acid phosphate and with a 2–12–2 fertilizer. See also a note on the utilization of nitrogen (E. S. R., 57, p. 128).

About three-fourths of the phosphorus applied was taken up by the plant when the acre fertilization rate was equivalent to 100 lbs. of 16 per cent acid phosphate. The amount of phosphorus absorbed varied with the soils and was respectively greater and less than 75 per cent in soils low and in soils high in phosphorus. The maximum utilization of phosphorus occurred in the zone of greatest root development, which was less than 6 in. from the center of the corn hill. Addition of ammonium sulfate and potassium chloride to acid phosphate to make a 2–12–2 fertilizer did not increase the total absorption of phosphorus from acid phosphate.

A method for storing small quantities of seed corn, H. W. ALBERTS (*Jour. Amer. Soc. Agron., 19 (1927), No. 6, pp. 567, 568*).—Seed corn containing about

10 per cent of moisture was stored during December at the University of Illinois in an uncovered metal container about half as large as a barrel with oats of similar moisture content filling the voids between the ears and in 4-in. layers at the bottom and on top. The moisture content of corn exposed in open air fluctuated with variations in relative humidity, while that of the corn stored in the oats increased very slowly. The moisture content of both oats and corn changed very little at depths of 4 in. or more below the surface of the oats. This storage method is said to prevent mouse damage and rapid fluctuation in moisture content. Low moisture contents of both corn and oats are prerequisite to storage by this method.

New species of cotton plants from Sonora and Sinaloa, Mexico, O. F. Cook and J. W. Hubbard (*Jour. Wash. Acad. Sci., 16 (1926), No. 12, pp. 333–339*).—Technical descriptions and a determinative key are given for the cotton species noted earlier (E. S. R., 57, p. 230).

A modified method of delinting cotton seed with sulphuric acid, C. D. Sherbakoff (*Phytopathology, 17 (1927), No. 3, pp. 189–193*).—The essentials of this contribution from the Tennessee Experiment Station have been noted elsewhere (E. S. R., 56, p. 435).

Cultural tests with native Euphorbias [trans. title], P. Gillot (*Assoc. Franç. Avanc. Sci., Confs., Compt. Rend., 49 (1925), pp. 781–783*).—Trials with 8 species showed that *E. cyparissias* and *E. verrucosa* may be of value as oil seed plants, especially on the poorer soils or waste lands. The seeds contain from 30 to 35 per cent of oil. Cultural methods are indicated.

Lupine numbers [trans. title] (*Illus. Landw. Ztg., 47 (1927), Nos. 24, pp. 309–321, figs. 17; 25, pp. 325–339, figs. 8*).—The first number includes the following articles on lupines: Lupine Culture and Management, by F. Aereboe; Decreasing the Yield Variation of the Lupine Crop, by T. Roemer; Rational Lupine Utilization, by Schultz-Berdrow; Feeding Lupines to Sheep, by H. Luthge; The Place of the Lupine in the Crop Rotation, by Berkner; Diseases and Pests of the Lupine, by H. Pape; Machines for Separating Peas and Lupines, by Martiny; Lupines in Woodland, by Gehrhardt; and Methods of Feeding Lupines to Swine, by Opetz. The second number includes The Lupine in Crop Mixtures, by Sobotta; Culture and Improvement of the Yellow Lupine, by V. Senf; The Yellow Lüneburg Lupine, by O. Knapp; Rational Lupine Culture, by W. Kranz; The Blue Lupine, by Ohe; Fertilization Conditions in the Yellow Lupine, by C. Fruwirth; Is the Lupine Sensitive to Acid Soils? by M. Trénel; Removing Bitter Flavor from and Feeding Lupine Seed, by Gerlach; Lupine-Spring Rye Mixtures, by E. Boldt; Soil Types for Lupine Culture, by O. Zutavern; History and Classification of the Lupine, by L. Wittmack; and Lupine Meal as a Foodstuff, by M. P. Neumann.

Improvement of the pigeon pea, F. G. Krauss (*Jour. Heredity, 18 (1927), No. 5, pp. 227–232, figs. 5*).—As described in this contribution from the University of Hawaii, the pigeon pea, *Cajanus indicus*, consists of one variable species subdivided into *C. flavus*, which has yellow flowers and self-colored seeds and pods, the latter glabrous, and *C. bicolor*, yellow flowered with back of standard red, seeds speckled, pods blotched with maroon, and surface pubescent. The varieties vary greatly in general growth habits and in inflorescence, seed, and pod characters.

Inheritance studies in a number of pure lines showed that some characters definitely follow the Mendelian law. Red flower standards are dominant over yellow, blotched or speckled seeds over self-colored, and maroon blotched pods over self-colored light tinted. Pubescent pods are dominant over glabrous, large flat pods over small round pods, large seeds over small seeds, four- and

five-seeded pods over three- and four-seeded pods, and round seeds, slightly flattened, dominate over all others of widely different shapes and forms. Axillary flowers and pods dominate over those located in the terminal inflorescence. There is a tendency toward blended inheritance in stature in that crossing very dwarf varieties with very tall varieties tends to produce an intermediate type, although crossing two tall types almost invariably produces a form taller than either parent. Crossing an annual type on a perennial type appears to produce perennial forms.

In so far as reciprocal crosses have been studied, the above behavior remains constant in that practically complete dominance for some well-defined differentiating unit character is the rule. Although some blended inheritance is apparent, as when red-colored dorsal standard sorts were crossed with red types, the solid red gave way to red lacing, and when extremely tall and dwarf forms were crossed the F_1 gave intermediate stature. Wherever dominance is apparent, F_2 shows fairly definite Mendelian segregation as well as definite linkage between some characters. Dihybrid crosses thus far studied appear to adhere rather closely to the 9-3-3-1 ratio.

A new hybrid in Cajanus designated "New Era, Strain X," is characterized by strong upright growth, deeply penetrative taproot, reasonably early maturity, and extraordinarily heavy seed production.

Delayed dormancy as a probable cause of uneven stands in planted potatoes, A. T. Evans (*Amer. Jour. Bot., 14 (1927), No. 5, pp. 284-286, pl. 1*).—Treatment at the South Dakota State College wherein Early Ohio potatoes were immersed in a solution of 60 cc. of ethylene chlorohydrin per gallon of water for 1 hour and stored 16 hours in a covered container before planting resulted in quicker germination and growth and more even stands than without treatment. Young tubers on treated vines were about twice as large as on untreated vines, and their size seemed closely correlated with vine development. No harvest data were available.

Proceedings of the thirteenth annual meeting of The Potato Association of America (*Potato Assoc. Amer. Proc., 13 (1926), pp. 182, figs. 6*).—The thirteenth annual meeting of the association, held in Philadelphia, Pa., in December, 1926, is reported on, and the activities of the organization and of its committees in 1926 are summarized. Included among the papers are Comparative Effectiveness of Organic and Inorganic Fertilizer Mixtures in Potato Production, by B. E. Brown; The Effect of Soil Reaction on the Fertilizer Requirements of the Potato, by J. Bushnell; Benefits Derived by New York State Growers from the Florida Seed Source Test, and Some Factors Other Than the Standards Affecting Uniformity in Certified Seed Potatoes, both by K. H. Fernow; Strains of Seed Potatoes, by F. M. Harrington; Sources of Certified Seed Potatoes, by G. L. Tiebout; A Test of a Horse-Drawn Machine for Planting Seed Plots by Tuber Units, by R. Bonde and D. Folsom; The Occurrence of Sprout Tubers and Some Factors Relating to Their Development, by F. Weiss and P. Brierley; Some Factors Affecting Tuber Shape in Potatoes, by E. V. Hardenburg; The Hollow Heart Situation in the Russet Rural Potato, and Further Report on Environmental Relations to Quality in Seed Potatoes, both by H. O. Werner; Genetic Studies in Potatoes.—II, The Inheritance of Red Cortical Color in Tubers, by F. A. Krantz (E. S. R., 57, p. 520); The Behavior of a Tuber Bud-Mutation in the Rural Potato, by K. W. Lauer; The Superiority of Freshly Mixed Copper-Lime Dust for the Control of Potato Hopperburn, by P. E. Tilford; Does Black-Leg Overwinter in Apparently Healthy Potato Tubers, by H. N. Racicot; Potato Scab Control with Organic Mercury Compounds, by W. H. Martin; The Efficiency of Organic Mercury Compounds for

the Control of Rhizoctonia on Potato, and Induced Dormancy in Seed Potatoes Due to Seed Treatment, both by R. P. White; Low Temperature Injury to Potatoes When Stored Shortly After Harvest, by W. M. Peacock and R. C. Wright; Preliminary Report on Investigations of Ventilation and Insulation in Potato Storage in Maine, by R. G. Hill, M. C. Betts, and W. T. Pentzer; *Investigation of Potato Storage Rots in 1925–26 at the Marble Laboratory*, Inc., Canton, Pa., by F. Weiss, J. I. Lauritzen, and P. Brierley; Potato Storage House Requirements, by M. C. Betts; Are Seed Potatoes Injured by Freezing Suitable for Planting? by R. C. Wright and W. M. Peacock; and Michigan's 300 Bushel Potato Club, and Hollow-Heart of Potatoes: A Report of Experiments Conducted in 1926, both by H. C. Moore.

Tillering of rice, D. CALVO (*Philippine Agr.*, *16 (1927), No. 2, pp. 89–103*).—The tillering power of 32 varieties of rice and the effect on tillering of spacing, planting method, seeding rate, and age of seedlings at transplanting were studied at Los Banos, P. I.

Lowland rice varieties were observed to differ in their tillering power, the average number of fruiting culms per plant ranging from 3.7 for Daluson to 16.7 for Roxas. An increase in the average number of fruiting culms per hill was accompanied by a greater range of variability and a larger probable error. With one seedling per hill in both cases, transplanting seedlings when 4 weeks old produced 9.8 tillers per hill, while direct planting of seed produced 6.2 tillers. Increased numbers of fruiting culms were produced at the wider spacings, 12.5 by 12.5 cm. (5 by 5 in.), averaging 7.6 tillers per plant and 50 by 50 cm. 11.3 tillers, whereas the number of fruiting culms per unit area diminished in the wider spacings. As the seedlings were gradually increased from 1 to 4 a regular increase occurred in the number of tillers produced per hill, whereas the number of fruiting culms per plant decreased. The number of tillers produced per plant increased with the age of seedling up to 6 weeks, although beyond this age the tillering power diminished.

Morphological studies on rye spikes from Anatolia [trans. title], BERKNER and K. MEYER (*Ztschr. Pflanzenzücht.*, *12 (1927), No. 3, pp. 229–245, pls. 2, fig. 1*).—Spike, glume, awn, and kernel characters of spikes of rye obtained in Turkey (Asia Minor) are described in some detail.

A five-year variety test with winter rye at Flahult [trans. title], H. WITTE and H. OSVALD (*Svenska Mosskulturför. Tidskr.*, *41 (1927), No. 4, pp. 247–259*).—In this test of six varieties the average yields of grain and straw were nearly the same for Petkus, Stjärnråg, Stålråg, and Improved Wasaråg. The yields of grain ranged from 40.05 to 41.64 bu. and those of straw from 4,993 to 5,118 lbs. per acre. It is pointed out that in comparisons at Svalöf, the test farms of the Swedish Seed Association, and local field tests the average grain yields of Petkus rye stood 8 per cent below the yield of Stjärnråg and 10 per cent below the yield of Stålråg, but the relative standing of Stjärnråg and Stålråg and of Petkus and Gråråg was about the same in both series of tests. Of the varieties tested at Flahult, Stålråg and Storm II are classified as high in strength of straw, Petkus and Stjärnråg as medium, and Improved Wasaråg and Gråråg as low.

The bushel weight ranged from 53.52 lbs. for Storm II to 55.52 lbs. for Gråråg and Improved Wasaråg. Among these six varieties Petkus produced the largest kernels and Gråråg the smallest. This is reflected in the weight per thousand kernels, in which Petkus ranked first with 28.6 gm. and Gråråg last with 19.9 gm.

Selection for quality of oil in soy beans, L. J. COLE, E. W. LINDSTROM, and C. M. WOODWORTH (*Jour. Agr. Research* [*U. S.*], *35 (1927), No. 1, pp. 75–95,*

figs. 3).—Selection continued for 7 years within a soy bean variety at the Wisconsin Experiment Station resulted in a high and a low oil line differing significantly in their average iodine numbers, which for the last 3 years' data averaged 133.7 and 124.9, respectively. This appeared to be the result of isolating two different genotypes within the original variety rather than of any change in a pure line. Selected entirely on the basis of chemical analyses, the high line proved to be a late, tall type with purple flowers, and the low line was an early dwarf with white flowers, indicating that the original commercial variety was neither a pure line for oil characteristics, season, growth habit, or even flower color.

According to available data, high quality of soy bean oil seemed intimately correlated with a certain lateness of maturity, it being inferred that late maturity (in Wisconsin) provides the more favorable conditions for the complete development of unsaturated acids responsible for high quality of oil. Selection for high or low oil quality had no appreciable effect on the quantity or percentage of oil produced by the plant; no consistent correlation was found between iodine number and percentage of oil. Selection for high quality without decreasing the percentage of oil seemed possible, although this does not hold for large increases in the quality of soy bean oil in any one variety by selection methods of breeding.

Effect of various fertilizers and lime on composition of soybeans, G. L. Schuster and J. M. Graham (*Jour. Amer. Soc. Agron., 19 (1927), No. 7, pp. 574–576*).—Data for three years on soy beans grown at the Delaware Experiment Station on plats variously fertilized and limed and unlimed indicated that the composition of the soy bean can not be changed by soil treatments. Improvement in oil and protein content should be sought in genetics.

The culture and manuring of sugar-beet (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Conferences, No. 4 (1927), pp. 56, figs. 3*).—This is the report of a conference held at Rothamsted on January 19, 1927, and includes papers on Continental Experience with the Growth of Sugar-Beet, by J. M. Van Bommel Van Vloten; What the Factory Wants and How the Farmer Can Supply It, by T. G. Fowler; Manurial Experiments with Sugar-Beet at Rothamsted and Woburn, by C. Heigham and H. J. Page; Effects of Climate on the Cultivation of Sugar-Beet, by I. J. Schapringer; Practical Experience with Sugar-Beet in S. W. England, by C. J. Clark; and Experience with Sugar-Beet in the Midland Counties, by R. N. Dowling.

[Time of applying sodium nitrate to sugar beets], J. Souček and F. Kraus, trans. by F. Heller (*Listy Cukrovar., 45 (1926–27), p. 222; Ger. trans. in Ztschr. Zuckerindus. Čechoslovak. Repub., 51 (1927), No. 37, pp. 417–421; Fr. abs., p. 421*).—Sodium nitrate was applied at the rate of 300 kg. per hectare (267 lbs. per acre) to sugar beets all at planting, half at planting and half at thinning, and all at thinning. When harvested in late September the treated beets were not ripe, and their sucrose contents were below those of untreated beets, whereas when harvested in early November all beets were ripe and similar in sugar content. Late application of sodium nitrate with early harvest was unprofitable. The most satisfactory results may be had from applying the sodium nitrate half at planting time and half at thinning.

Ring density of sugar beets as a character for selection, D. A. Pack (*Amer. Jour. Bot., 14 (1927), No. 5, pp. 238–245, figs. 2*).—The ring density, i. e., number of vascular rings: radius of beet in centimeters, was studied in relation to several other characteristics of the sugar beet. The complete material used was representative of the beets used in selection work.

The correlations between the ring density of the sugar beet and its percentage of sucrose, purity, and hardness were found to be positive and probably signifi-

cant. Ring density is negatively correlated with weight of beet and sucrose content of beet. Since the sucrose percentage is extensively influenced by external conditions, analyses might well be supplemented by selection for some constant characters correlated with the valuable beet characters. If ring density is used as a selection character for enhancing quality of the sugar beet, selection for root weight must be duly considered. Data on pure lines substantiated the other results.

Emergency methods for reconstitution of flooded sugar-cane districts in Louisiana, E. W. BRANDES (*U. S. Dept. Agr., Misc. Circ. 107 (1927), pp. II+6, figs. 6*).—A method of water sprout or sucker transplanting is outlined and illustrated for the purpose of providing a supply of seed cane, and emphasis is laid on the importance in the emergency of immediate propagation of seed cane.

Natal Sugar Experiment Station: Annual report for the year 1926–1927 (*So. African Sugar Jour., 11 (1927), No. 5, pp. 319–339*).—Experiments at Mount Edgecombe near Durban reported on included variety, fertilizer, and green-manuring trials, and soil analyses.

An experimental study of sweet clover, C. J. WILLARD (*Ohio Sta. Bul. 405 (1927), pp. 84, figs. 25*).—Investigations on sweet clover (*Melilotus* spp.) at Ohio State University from 1921 to 1925 gave information on the development of sweet clover; stand changes during the life cycle; yields of dry matter at successive periods and losses during winter; time of plowing up the crop; productivity of summer seedings; nitrogen and mineral elements in sweet clover, including analyses; the top-root ratio in sweet clover and other crops; the relative merits of Hubam (E. S. R., 47, p. 137), yellow sweet clover, and other varieties and species; and comparisons with other legumes (E. S. R., 55, p. 32). The harmful effects of fall cutting first-year sweet clover have been noted (E. S. R., 57, p. 632).

Miscellaneous studies reported on were concerned with the distribution of sweet clover roots, proportions of leaves and stems in the hay, composition of leaves, stems, and seed, the feeding value of sweet clover, nitrogen losses from the tops of sweet clover and other legumes during winter, the air dry-green weight ratio, effects of nurse crops, and the relation of stand to yield.

Tobacco culture, A. J. W. HORNBY (*Nyasaland Dept. Agr. Bul. 1 (1926), pp. 89*).—Production methods with tobacco in Nyasaland and the United States are described in comparison.

Transpiration ratio of wheat at different stages of growth, A. E. V. RICHARDSON (*Australasian Assoc. Adv. Sci. Rpt., 17 (1924), pp. 662–666*).—Further studies (E. S. R., 50, p. 733) at the Rutherglen (Victoria) Experiment Farm on the water requirement of wheat showed a steady increase in the transpiration ratio from the first (tillering) to the sixth (ripe) growth stage. Wheat took up the greater part of the mineral nutrients during the early growth stages.

Microscopy of agricultural weed seeds, J. GREGER (*Mikroskopie der Landwirtschaftlichen Unkrautsamen. Berlin: Paul Parey, 1927, pp. VII+117, figs. 106*).—This manual outlines the technique and lists reagents and equipment deemed essential to the microscopical study of weed seeds. Descriptions of the sections of the seed coats or pericarps of important species are supplied, with a list of 66 citations.

Old World weed introductions, P. B. KENNEDY and A. FREDERICK (*Jour. Amer. Soc. Agron., 19 (1927), No. 7, pp. 569–571, figs. 9*).—Fenugreek seed bought from a poultry food company by the California Experiment Station contained, besides weeds noted in American literature, seeds of *Emex spinosus*, *Krubera peregrina*, *Bifora testiculata*, and *Bupleurum subovatum*, which are described and illustrated. The danger of introducing noxious weeds in seed imported for stock food and subsequently sold for seed is emphasized.

Weeds and weed seeds (*Canada Dept. Agr. Bul. 4, n. ser.* (*1927*), *pp. 64, figs. 178*).—A revision of the publication noted earlier (E. S. R., 46, p. 443).

Extermination of grassland weeds, E. Neuweiler (*Internatl. Rev. Agr., n. ser., 18* (*1927*), *No. 3, p. 344* (*184T*)).—Cutting off the inflorescence, pouring water over the plant, and putting either dry potash salt, sodium chlorate dry or in solution, or solutions of barium chloride or picric acid on the wounds is said to have been successful in controlling bitter dock (*Rumex obtusifolius*) in meadows in Switzerland. Barium chloride gave the best initial results, although the herbage was greatly benefited by the potash.

Destruction of tall couch, F. W. Greenwood (*New Zeal. Jour. Agr., 34* (*1927*), *No. 5, pp. 338, 339, figs. 2*).—Additional evidence of the effectiveness of a seed vetch crop in smothering tall couch grass (E. S. R., 55, p. 438) is presented.

The problem of Dichrostachys nutans, a weed tree in Cuba, with remarks on its pathology, J. R. Weir (*Phytopathology, 17* (*1927*), *No. 3, pp. 137–146, pls. 3, figs. 4*).—*D. nutans*, or marabu, a dangerous weed tree introduced into Cuba from Senegal, has become a serious menace on arable lands, forming veritable forests on abandoned cane land. The danger of its introduction into the United States is said to be very great. Eradication is extremely difficult because of the prolific sprouting of the lateral roots after the parent tree has been cut. Individual plants are effectively killed by the application of crude petroleum or other substances used in eradicating the barberry. The only known practical method of eradication over large areas of pure stands is by slashing and burning. Study of diseases and insect pests of marabu may result in a practical control method.

HORTICULTURE

[Horticultural investigations at the Idaho Station] (*Idaho Sta. Bul. 149* (*1927*), *pp. 30, 31, 32*).—Of 309 apple seedlings resulting from a Ben Davis by Jonathan cross, 83 yielded sweet, 97 mildly subacid, 107 subacid, and 22 sour fruits. The progeny of the cross thus exhibits a wide range in acidity irrespective of the character of the parents. Some apparent correlation was found between mean acidity of the progeny and that of the parents of various crosses. With the exception of slight gains in nitrate plats, fertilizers did not materially affect yields nor cause any appreciable difference in color or size of the fruit or in the length of the terminal growth.

Variable results secured in vegetable fertilizer tests are attributed to an unusual dry period in the early part of the 1926 growing season. A comparison of strong, stocky cabbage plants with slender, small plants suggests the advisability of discarding the latter at the time of planting.

[Horticultural investigations at the New Jersey Stations] (*New Jersey Stas. Rpt. 1926, pp. 263–277, 277–299, 301–303, 304, 306, 307, 308–312, pls. 2*).—The customary annual report (E. S. R., 57, p. 39).

A study by M. A. Blake of the cause of split pit in peaches leads to the suggestion that winter injury, borers, or other factors may interfere with the downward passage of elaborated food, the excess of which apparently causes a splitting of the pit in its early stages of development. Data collected by C. H. Connors upon the rate of growth of Elberta and J. H. Hale peaches in the 1921 season are presented and analyzed in detail. Peach breeding operations for the 1926 season, conducted by Connors, involved a total of 9,580 pollinations. Observations on 10 seedlings resulting from the self-pollination of Eclipse showed all to have the same flesh color, yellow, as the parent, and to be of the same shape and about the same season of maturity. J. H. Hale

attempted between the almond and the peach. A complete list is presented of peaches and other related forms of Prunus growing on the station grounds. *Slight self-fruitfulness in the J. H. Hale peach was shown in 5 fruits from* 592 protected blooms in 1925 and 7 fruits from 500 blooms in 1926. A fairly *good set of fruit was obtained upon covered trees of Krummel October,* Late Champion, Lippiatt Late Red, and Osprey Improved peaches. In apple breeding Starr proved a *satisfactory pollinizer for Wealthy.*

Activities in carnation breeding conducted by Connors were confined largely to the improvement of yellow, scarlet, and deep pink varieties. The Laddie carnation, used in breeding work, possesses many desirable commercial qualities, but is pollen-sterile and inclined to phyllody of the ovules. Color control studies by Connors with hydrangeas verified previous findings, namely, that color is influenced by the acidity reaction of the soil in which the roots are growing at the time the flower buds are formed. For this reason it is deemed important that plants be potted from the field with sufficient length of time to develop a full root system, or possibly be treated in the field itself. Studies by Connors of the effect of potassic fertilizers upon root production in the dahlia yielded negative results.

Spraying investigations conducted at New Brunswick by A. J. Farley and J. H. Clark showed finely ground peat and gypsum to be ineffective substitutes for hydrated lime in the preparation of dry mix spray for peaches. Freshly slaked stone lime proved more effective than hydrated lime in reducing arsenical injury. The value of lime was also shown in a spraying test in a peach orchard of mixed varieties at Bridgeton, the two treatments using arsenate of lead without lime showing considerable leaf injury, some defoliation, and some cankering of the one-year wood. The need of abundant lime in connection with lead arsenate or sulfur lead arsenate mixtures was indicated by some injury on practically all plats.

Pollen of Baldwin, Delicious, Golden Delicious, Gravenstein, Grimes, Jonathan, McIntosh, Melba, Rome, Smokehouse, Starking, Starr, Stayman Winesap, and Wealthy applied to blooms of a vigorous 10-year-old Stayman Winesap tree gave 0, 17+, 18+, 0.22, 10+, 20, 15+, 12+, 12+, 1+, 7+, 10+, 0.91, and 12+ per cent of set, respectively. At the same time, on open-pollinated branches *sets of 21+ and 17+ were obtained.* The importance of adequate nutrition with respect to fruit setting was shown in the case of a low-vigor Stayman Winesap tree at Clayton, from which practically all fruits dropped shortly after petal fall, irrespective of the kind of pollen applied.

Observations on the vigor of Howard 17 strawberry plants obtained from four sources showed the importance of using only strong vigorous plants and of setting early in the spring.

Observations on the bearing habit in the Baldwin, Wealthy, and McIntosh trees showed marked differences between trees of the same variety according to age, vigor, etc. A 9-year-old Baldwin tree producing 16.5 bu. in 1925 yielded nearly 75 per cent of its fruit on terminals. Grading of fruits showed the spur-borne fruits to be the largest, followed in order by terminal and axillary fruits. Measurements taken by Clark on Stayman Winesap apples showed a ratio of 1:1.21 of the vertical with a cross diameter on July 6 and 1:1.24 on October 6, suggesting that the fruits become more oblate toward maturity.

Data are also presented on the commencement of bearing and the comparative yields of young trees of standard apple varieties, upon the propagation and distribution of peach seedlings, and upon variety tests with apples, crab-apples, grapes, strawberries, raspberries, and blackberries. Tabulated phenological data obtained in various counties upon peaches and apples are appended.

As reported by L. G. Schermerhorn, the highest yield of carrots, 6.4 tons per acre, was obtained from the use of a mixture of 800 lbs. of acid phosphate, 200 lbs. of potassium chloride, and 100 lbs. of nitrate of soda. In studies with celery, the maximum yield was secured upon an area fertilized with 800 lbs. of acid phosphate, 200 lbs. of potassium chloride, and 200 lbs. of nitrate of soda. Results obtained at New Brunswick and also in Gloucester County indicated the value of heavy fertilization for asparagus. Cantaloupes started in veneer bands as compared with those open-field planted were earlier in ripening and produced greater yields irrespective of fertilizer treatment. The value of manure was strongly evident during the dry season of 1925. Ruby King peppers, Howling Mob sweet corn, and Greater Baltimore tomatoes showed a marked response to delayed applications of nitrate of soda.

Records taken by H. F. Huber upon the growth of Palmetto asparagus plants, carefully graded at the time of planting, showed no significant difference between the first and second grades, with culls decidedly inferior. Studies by G. T. Nightingale and Schermerhorn upon the growth response of asparagus plants growing in continuous darkness in plus nitrogen and minus nitrogen nutrient solutions, and in normal light in a plus nitrogen solution indicated that asparagus may not only absorb nitrates in the dark, but as long as there is a carbohydrate supply present seemed to be able to synthesize nitrates into higher forms. The assimilation of nitrates apparently occurred as rapidly in darkness as in light. Abundant nitrates were found in the fibrous roots, with none or extremely small amounts in the storage roots. No nitrates were found in the spears growing in darkness except occasional traces in the lower portions. Nitrates were found in the spears exposed to the light only when growth was slowed up, and then in the tips and lower parts. At no time were nitrates found in any parts of the plants of the minus nitrogen series. Growth in the minus nitrogen series was associated with a decrease in protein and an increase in nitrate-free soluble nitrogen, while in the plus nitrogen nutrient series growth was associated not only with a loss of protein but apparently with a synthesis of nitrates to other forms of nitrogen. Proteose, polypeptide, amide, amino, and humin nitrogen were determined in the nitrate-free soluble nitrogen fractions. The loss of carbohydrates associated with the growth of spears was much greater in the plus nitrogen nutrient dark series than in the minus nitrogen dark series. An earlier paper on this experiment has been noted (E. S. R., 56, p. 344).

Standard descriptions of vegetables.—Beets and carrots, T. F. Ritchie (*Canada Dept. Agr. Bul. 82, n. ser. (1927), pp. 36, figs. 13*).—Supplemented by photographs of typical roots, descriptions are given of important commercial varieties with a view to aiding seed producers and vegetable growers.

Tendencies in deciduous orcharding, U. P. Hedrick (*Natl. Pecan Growers Assoc. Proc., 25 (1926), pp. 68–73, 75*).—A broad outlook upon the present status of investigation and practice in fruit growing.

Apple pollination studies in Ohio, F. S. Howlett (*Ohio Sta. Bul. 404 (1927), pp. 84, figs. 13*).—Following an earlier paper (E. S. R., 57, p. 48), herein is presented a complete summary of results obtained in apple pollination studies conducted at Wooster and Hamden during the years 1924–1926.

In respect to self-fruitfulness as determined under control conditions, Baldwin, Delicious, Grimes, and Rome were the only varieties to produce fruits from self-pollinated blooms. As compared with a maximum set of 2.0 per cent for hand-pollinated Baldwin flowers, a set of 6 per cent at harvest was secured in the case of a tree inclosed with bees. No variety was found sufficiently self-fruitful to warrant planting singly.

Determinations of pollinating capacity showed Delicious, Ensee, Golden Delicious, Grimes, Jonathan, McIntosh, Northern Spy, Rome, San Jacinto,

Wealthy, and Yellow Transparent to be effective pollenizers for all varieties upon which used. Baldwin, Banks, Nero, Ohio Nonpareil, Rhode Island, and Stayman Winesap were not satisfactorily effective in any instance. Gallia Beauty proved satisfactory for Stayman Winesap but of little value for Rome. A positive correlation was noted between pollinating ability and pollen germination, the effective pollenizers giving high percentages of germination and long tube growth. No definite cases of physiological cross-incompatibility were observed.

Records showed Baldwin, Ensee, Golden Delicious, Grimes, Jonathan, McIntosh, Northern Spy, Oldenburg, Rome, Wealthy, and Yellow Transparent to give high percentages of set when pollinated with effective varieties. On the other hand, Delicious, Nero, Ohio Nonpareil, Rhode Island, and Stayman Winesap gave rather unsatisfactory results irrespective of the pollenizing variety, indicating that a considerable number of the blooms were unable to set fruit. Such results are attributed to partial cross-sterility (intersexualism).

Studies of methods of technique indicated that covering the blooms after selfing and crossing does not apparently reduce the set of fruit. In fact, emasculated and uncovered flowers failed in a number of cases after cross-pollination to set as well as covered flowers. Observations on emasculated, uncovered blooms gave no indication that apple pollen is carried by the wind. This evidence was supported by the fact that exposed vaseline-covered strips caught no pollen. The author concludes that unusual care must be taken in interpreting the results of orchard studies of self-fruitfulness.

Sterility in peaches, C. H. Connors (*Mem. Hort. Soc. New York, 3 (1927), pp. 215–221*).—A contribution from the New Jersey Experiment Stations pointing out that two types of sterility, namely, embryo abortion and pollen sterility, have been found in the course of breeding operations with the peach, with a possibility that the formation of button peaches in the J. H. Hale and other varieties may be a third type of sterility, pseudogamy. Embryo abortion is exhibited in very early ripening varieties such as Mayflower and Wheeler, neither of which has produced viable seed either at Vineland or New Brunswick, N. J.

Pollen sterility was noted in the Chinese Cling, J. H. Hale, and in various seedlings, and occasionally in Late Crawford, Elberta, Belle, St. John, and Early Crawford. The anthers of pollen-sterile flowers were notably pale in color, and upon examination were found filled with a shrunken mass of broken-down tissue, abortion taking place according to Knowlton (E. S. R., 53, p. 39) after the tetraspore stage. Of 127 seedlings of J. H. Hale resulting from open pollinations, 33 per cent were found pollen sterile based upon the appearance of the anthers. The nearly complete sterility in J. H. Hale and Chinese Cling was shown in 13 and 4 fruits from 2,800 and 250 covered blossoms, respectively.

Report of the Cranberry Substation, C. S. Beckwith, B. F. Driggers, and C. D. Jones (*New Jersey Stas. Rpt. 1926, pp. 215–218, 221, 222*).—Contrary to the results of the preceding year (E. S. R., 57, p. 45), and in fact for the first time since the beginning of the experiment, dried blood had a greater stimulating effect on cranberry yields on Savannah soil than did nitrate of soda. The results of a quantitative study with mixed fertiliser composed of 125 lbs. of nitrate of soda, 300 lbs. of acid phosphate, and 50 lbs. of sulfate of potash indicated that over a series of years 500 lbs. is an adequate annual application. Arsenical weed killers showed promise for clearing stagnant ditches of foreign growth and for killing out vegetation. A lack of sunshine during the blooming season of 1925 apparently materially affected pollination and the resulting crop.

Records upon the effect of regulating the depth of the water table upon the *annual growth of cranberry vines* and the percentage of fruit rot showed the best growth and the highest yields of fruit and the lowest percentage of rot where the water table was held considerably below the surface. A short crop of berries and favorable conditions with respect to infection materially reduced the percentage of decay.

Pollination in coconut, M. G. Kidavu and E. K. Nambiyar (*Madras Agr. Dept. Yearbook 1925, pp. 43–49, pls. 3*).—Observations upon the habits of flowering and the methods of pollination in the coconut showed variations not only between trees, but also upon a single tree in the time elapsing between the appearance of successive spathes and in the time required for splitting, etc. In a single spathe, all the male blooms generally shed their pollen before the female flowers were receptive. Sometimes, however, pollen shedding and receptive female blooms occurred simultaneously upon neighboring spathes. Pollen remained viable for from 6 to 10 days. Among the agents furthering pollination were insects, small birds, and the wind. Cross-pollination was prevented by covering with double muslin bags. Coconuts resulting from controlled pollination germinated readily.

Vegetative and fruiting branches in the date palm and sterile intermediates between them, W. T. Swingle (*Mem. Hort. Soc. New York, 3 (1927), pp. 213, 214*).—In the normal march of growth of the Deglet Noor very young palms produce only vegetative buds. From 3 to 8 years part of the buds are vegetative and part reproductive. After this time all the buds give rise to inflorescences. A certain proportion, about 10 per cent of the offshoots, were observed to be abortive, being slender and weak and finally developing an abnormal flower cluster. Furthermore, certain of the buds gave rise to a slender growth, uncovered in contrast with normal flowers and which had meager development. These abortive offshoots often constitute a considerable proportion of the buds, particularly on inflorescences attached to young palms which have just reached the fruiting stage.

Sterility in filberts, C. E. Schuster (*Mem. Hort. Soc. New York, 3 (1927), pp. 209–211*).—Studies at the Oregon Experiment Station showed all commercial varieties of filberts to be self-sterile, with some showing a decided tendency to partial intersterility. Complete intersterility was very rare, one example being the cross Barcelona × Fertile de Coutard. Blooming in the filbert extended from late December to the middle of April. A few varieties, including Cosford, complete pollen shedding before the pistils appear. Attempts to hybridize cultivated filberts with several species met with complete failure. A more complete report of these experiments was noted earlier (E. S. R., 52, p. 238).

Pecan soils and their fertilization, J. J. Skinner (*Natl. Pecan Growers Assoc. Proc., 25 (1926), pp. 54–61*).—An analysis of seven years' records taken by the U. S. Department of Agriculture in a fertilizer study in a pecan orchard on Orangeburg sandy loam at Putney, Ga., showed that a complete fertilizer mixture was most effective. Nitrogen was, however, apparently the most effective of the three principal elements. The gain in circumference was greater where nitrogen was used alone than where combined with either potash or phosphorus. No significant differences were noted in the responses of the three varieties Schley, Alley, and Stuart.

The value of fertilizers for the pecan was shown in another orchard located between Albany and Putney. Over a six-year period, fertilized Stuart trees produced more than four times as many nuts as did the control trees. Ground rock phosphate alone more than doubled yields, and ground limestone increased

yields over 47 per cent. In the case of the Schley variety no benefit accrued from rock phosphate with moderate increases from commercial fertilizer and limestone.

No beneficial effect on the growth of pecans was obtained from either ground rock phosphate or limestone on a Kalmia fine sand at Oglethorpe, Ga. Data obtained in nine cooperative tests in large, well-conducted commercial orchards operated upon the cultivation cover crop basis showed definitely that the production of nuts may be increased from the use of fertilizers, leading to the general recommendation that fertilizers may be expected to give returns in well-cared for orchards in Georgia, Florida, and Alabama located on soils similar to those of the experiments.

The fruit-bud, flower, and then the pecan nut, J. G. WOODROOF (*Natl. Pecan Growers Assoc. Proc., 25 (1926), pp. 81–89, figs. 4*).—Based on cytological studies at the Georgia Experiment Station with 28 varieties of pecans, the author traces the various stages of development from the differentiation of the flower bud to the maturation of the nut.

Ornamental gardening in Florida, C. T. SIMPSON (*Little River, Fla.: Author, 1927, pp. X+243, pls. 45*).—A popular treatise devoted chiefly to plant materials.

FORESTRY

Forestry as a profession, E. A. SHERMAN (*U. S. Dept. Agr., Forest Serv., 1927, pp. 16*).—A brief pamphlet discussing the personal qualifications essential to a forester and the opportunities for trained men in public and private fields of activity.

Factors controlling germination and early survival in oaks, C. F. KORSTIAN (*Yale Univ. School Forestry Bul. 19 (1927), pp. 115, pls. 7, figs. 22*).—That many limiting factors interfere with normal reproduction in the oak was shown in experiments conducted cooperatively by the Appalachian Forest Experiment Station of the Forest Service, U. S. D. A., and the Yale School of Forestry.

Observations showed that in many cases, especially in short seed years, from 90 to 100 per cent of the acorns may be destroyed by animals. Weevil injury varied from none in certain chestnut oaks to over 50 per cent in some black oaks. Moisture content was found to be an important factor in germination. In the white oak, with a normal moisture content of 60 to 70 per cent of the dry weight, viability was significantly decreased when the moisture declined below 25 to 30 per cent, and in the red oak, normally 50 to 60 per cent, when the moisture fell to 20 to 30 per cent. Large, plump acorns gave the highest germination and also resulted in the most vigorous seedlings. Leaf litter was found of great importance in the maintenance of favorable soil moisture, temperature, and texture conditions. The temperature range was wide, but when promptness of germination and total germination were considered, an average night temperature of 50° F. and a day temperature of 65° F. proved most satisfactory.

Delayed germination in the black oak group is believed to be associated with a high content of fats which likely have to undergo conversion into soluble carbohydrates. Acorns were found unable to survive surface-litter fires, and as determined in the laboratory, white oak acorns were most susceptible to high temperature, followed in order by scarlet, black, chestnut, and red oak.

For the retention of viability, high moisture and low temperature were found important factors. Checking actual root performance by a device for measuring the penetrability of the soil, the author found that the limit of penetration

for oak radicles in the soil type used occurred between 0.01 and 0.023 mm. per gram of load applied. *It is suggested that optimum seed-bed conditions may* be procured by a form of partial cutting, in which the stand is removed in two to three cuts.

Thinning young red pine, J. KITTREDGE, JR. (*Jour. Forestry, 25 (1927), No. 5, pp. 555–559*).—Data taken in May, 1926, following a crown fire, upon red pine trees which had been thinned and measured in June, 1923, showed a definite stimulation to diameter and volume growth in the two growing seasons following thinning. After thinning there were 1,869 trees per acre as compared with 5,751 for the control plat. Thinning increased the current annual volume increment percentage from 15.4 to 23. It is concluded that red pine stands 15 to 20 years old with over 5,000 trees per acre require thinning.

DISEASES OF PLANTS

Plant pathology (*Idaho Sta. Bul. 149 (1927), pp. 33–35*).—In an attempt to develop potatoes free from virus diseases, the early varieties Bliss Triumph, Irish Cobbler, and Idaho Rural were grown at Lewiston. Irish Cobbler from Idaho-certified seed gave higher yields and less virus disease infection than did the same variety from Minnesota. It appears impossible to distinguish mild mosaic under the environmental conditions prevailing in many sections of Idaho. A more severe type, perhaps identical with "rugose mosaic," is easily detected at any advanced stage.

It has been found possible, by five years of careful work of isolation and roguing, to eliminate practically all leaf roll infection from Netted Gems having originally more than 20 per cent infection.

In seed treatment tests for wheat bunt control, 20 compounds were tested, the treatments employing various organic mercury compounds as dusts or wet treatments, several other proprietary compounds, and the standard formalin, copper sulfate, and copper carbonate. The results in general corroborate those of recent years, several of the compounds giving as good control as the standard treatments; though considering cost, seed injury, and ease of application, none of them was as satisfactory as copper carbonate. Various compounds were tested for control of smuts on both hulled and hull-less oats. Formaldehyde seriously injured hull-less oats, hulled oats showing little injury and practically complete control. Copper carbonate this year (in contrast with previous experience) at 3 oz. per bushel gave perfect control with hulled oats, though further trials are considered necessary.

For potato Rhizoctonia control studies, 10 compounds were again tested in comparison with the corrosive sublimate and hot formalin treatments. It was found that hot formalin applied to presprinkled seed at 1 pint to 15 gal. of water at 125° F. for four minutes gave the best control.

Mosaic and dry root rot tests were made on 115 bean varieties, and a number of these appeared very resistant. Bean seed treatment tests still in progress with Semesan and Uspulun have shown resulting small yield increase.

Grain and grass stripe rust studies, though seriously hindered or prevented by conditions outlined, have given success in preliminary tests to germinate telia freshly collected at Moscow on *Hordeum jubatum*. Both on *H. jubatum* and on barley, age lowers the germination rate of the telia.

Report of the department of plant pathology, W. H. MARTIN ET AL. (*New Jersey Stas. Rpt. 1926, pp. 313–355, pl. 1, figs. 5*).—The more important of the year's activities are summarized below:

New Jersey Plant Diseases, 1925, W. H. Martin (pp. 314–324).—This report contains an account of New Jersey weather (including deviations from average

precipitations and temperatures) during 1925, and of plant diseases for the year, arranged according to hosts, which are in alphabetical order.

Potato Spraying in 1925, W. H. Martin and L. G. Campbell (pp. 324–329).—The season in central and southern New Jersey, where these spraying tests were continued (E. S. R., 57, p. 47) was very dry. Late blight was absent, early blight showing only a trace on the lower leaves. The abundance of leafhoppers present resulted in the early death of plants in plats sprayed only with an insecticide. In a comparison of 5–5–50 Bordeaux mixture applied at about 10-day intervals (standard treatment) with 10–10–50 applied at 20-day intervals, 3 tests were made on the commercial crop, two with the variety Irish Cobbler and the third with Gold Coin. In the first two tests increases were obtained of 52.8 and 53.8 bu. from 5 and 6 applications, respectively, of 5–5–50 Bordeaux mixture, as compared with increases of 41 and 41.9 bu. from 3 applications of 10–10–50 Bordeaux mixture. In the third test the increases were 77.3 from 7 applications of 5–5–50 and 77.8 from 4 applications of 10–10–50 Bordeaux mixture. With Irish Cobbler and Gold Coin varieties, copper hydrate and copper lime dust failed to control leafhoppers and gave only slight yield increases over the check plats.

Apple Blotch Studies, W. H. Martin (pp. 329–332).—Studies to determine the time of infection with the apple blotch organism, and at the same time to determine the most economical spray measures to control blotch, are outlined. The results indicate that the use of concentrated lime sulfur following the regular spray schedule will not give satisfactory control of blotch where the disease has previously been severe. Under this condition, the regular spray schedule, using lime sulfur 1–40 up to and including the 17-day spray, followed by 2 applications of Bordeaux mixture, one 28 and the other 42 days after petal-fall, give very good blotch control. It is questioned whether more than these 2 applications of Bordeaux are necessary during a dry year, but it is thought that it would probably be necessary in a wet season to make an additional application about 10 days later.

Apple-scab Studies, W. H. Martin and E. S. Clark (pp. 332–334).—Studies are outlined as carried out during the spring and early summer of 1925 to determine the time of maturity and discharge of ascospores of the apple scab fungus in relation to environmental conditions and blossom-bud development.

The ascospore discharge periods occurred, with only slight exception, on the day of rain or on the day after rain. The outside limits of observed discharge were for Moorestown April 25 and June 12; for New Brunswick April 28 and June 19. These results in central and south-central New Jersey are thought to be different from those which would probably be obtained in the northern part of the State. They suggest that, while spraying made before the regular pink application is probably of little value in central and southern New Jersey, in the northern part of the State a prepink, or delayed dormant application may be important in the control of scab.

Pea Root Rot Studies, C. M. Haenseler (pp. 334–339).—A summary is given of the year's records of studies to determine the exact soil temperatures necessary for infection of peas with the root rot organism (*Aphanomyces euteiches*), or any correlation of maximum, minimum, or mean soil temperatures with infection. The maximum and the mean daily temperatures fluctuated so irregularly during the test that no correlation could be established. The minimum soil temperatures were much more regular, and it appears that a minimum daily temperature of at least 14° C. (57.2° F.), lasting over a period of several days, is necessary for infection.

Tests to ascertain the resistance of *A. euteiches* to drying show that the oögonia may retain viability after remaining in dry soil for at least six weeks, so that the organism could be carried far on wind-blown particles in a viable condition.

In 1925 it was for the first time shown that many plants are susceptible to the root rot fungus and may carry it over from year to year. These include garden pea, Canada field pea, sweet pea, hairy vetch, cowpea, and sweet clover. Abundant oögonia containing normal mature oospores have developed in parts of various plants placed in water and inoculated with a suspension of zoospores of *A. euteiches*. Various plants tested 14 days after inoculation showed abundant normal oögonia in root tips and rootlets of crimson clover; roots of navy bean; roots, petioles, and leaf blades of red kidney bean; petioles of spinach; and leaf sheath of timothy. *A. euteiches* is thus easily able to prolong its existence in soil. It is thought that the organism may develop saprophytically in dead parts of several plants.

Infection with *A. euteiches* does not appreciably lower transpiration for several weeks after its occurrence. The zoospores may remain viable for at least 4 days, but not for a much longer period.

Hydrated lime at 4,000 lbs. per acre apparently reduces infection, but not at 2,000 lbs. or less. Acidification with large additions of sulfur prevents infection but injures the pea plant.

Further studies on arsenical injury of the peach, C. M. Haenseler (pp. 339–346).—Results of work during 1925, in continuation of that noted on page 752, showed that peach leaf, twig, or 1-year-old wood injury is closely correlated with lead arsenate percentage in the spray mixture. Leaf injury is lowered by increasing the lime or the sulfur ingredient, and twig cankering is slightly reduced. The factors controlling leaf injury do not seem to operate in case of wood cankering. Weather conditions, possibly humidity, seem to determine spray injury during the season. The first or the last applications may prove to be the most toxic. Nodes defoliated from various causes are very subject to cankering. Nodes with leaves attached do not canker. A spray may be followed by defoliation and subsequent cankering.

Sweet potato disease studies in 1925, R. F. Poole (pp. 347–355).—A continuation is reported of studies previously noted (E. S. R., 57, p. 47), on sweet potato stem rot (*Fusarium hyperoxysporum* and *F. batatatis*), which gave results that are considered valuable on account of the unusual severity during the year. Yellow Yam and Red Brazil, hitherto resistant, showed slight infection, and White Yam, Southern Queen, and Golden Gem showed slight stem rot kill. The Nancy Hall and Porto Rico varieties were again severely attacked. Soil type appears to be a significant factor in stem rot kill differences. Commercial value in stem rot resistant sweet potatoes is discussed.

The residual effects of lime and sulfur on sweet potato pox were studied, and the results support those previously obtained. It is difficult to bring pox-infected soils back to normal production, especially where lime has been applied in large quantities. The results have shown also that sulfur is most effective in wet seasons and slowly effective in dry seasons, and that the disease is most severe in dry seasons. However the use of sulfur apparently reduces the conditions most suitable for infection, while lime enhances those conditions.

Previous results having shown that large amounts of fertilizer caused severe injury to sweet potatoes, and that the losses from stem rot were greater on injured than on uninjured plants, further tests were conducted, in which kainit, sulfate, and potassium chloride were used to supply 7 per cent of potash in a mixture containing 2 per cent of nitrogen and 8 per cent of phosphoric

acid. The injury and kill were much greater where the mixture containing kainit was used instead of the other potassium salts. Yields were also greatly reduced on plats where kainit was used. Apparently, potash salts cause much injury, showing generally as a mottling or spotting of the leaves, but as previously shown, any and all of the several sources of potash used can be safely employed if applied several months previous to setting the plants.

Studies of the effect of sulfur and lime on the scurf disease of sweet potatoes showed an increase of 8.3 to 10.3 per cent of infected potatoes when lime was used, and this was true even where sulfur was applied the previous year. Apparently the growth of the plants was retarded on the limed plats. There was also slight evidence of chlorosis of the foliage.

Although there was a much smaller percentage of scurf infection in 1925 than in 1924, the results thus far indicate that 300 lbs. of sulfur on the sandy soils will reduce the disease for the year, but possibly not for the next year. Applications of from 300 to 600 lbs. per acre for 2 consecutive years reduced the disease, but slightly reduced yield.

The results of testing organic mercury compounds, mercuric chloride, and formaldehyde for the control of scurf or soil stain disease of sweet potatoes showed that the dust treatments were much more effective than the liquid treatments. Possibilities of the respread of fungus on potatoes treated with solutions was much greater than in case of those treated with the dust.

Reports on research for 1925 (*Brooklyn Bot. Gard. Rec., 15 (1926), No. 2, pp. 55–66*).—G. M. Reed reports in brief detail investigations with oat loose smut (*Ustilago avenae*) and covered smut (*U. levis*), also with sorghum covered kernel smut (*Sphacelotheca sorghi*) and head smut (*Sorosporium reilianum*). These studies dealt mainly with resistance and its inheritance. A. H. Graves notes greater resistance by roots than by shoots of chestnut trees to *Endothia parasitica*. *Creonectria coccinea* has been shown to be pathogenic to *Betula lenta*, *B. lutea*, and *B. alba papyrifera*, and *B. populifolia* is probably susceptible. H. S. Hill found that in over 70 samples certain of the Long Island soils gave pH values differing from 1.0 to 2.4 between the fresh samples and those stored for one year, the changes being from an acid to a more alkaline condition.

Investigations of dusts, spreaders, stickers, and diluents for spraying and dusting mixtures (*New Jersey Stas. Rpt. 1926, pp. 199–206, 207, 208, pl. 1*).—Two of the studies reported under this head are as follows:

Chemical studies of the New Jersey dry-mix spray in relation to arsenical injury, J. M. Ginsburg (pp. 199–206).—It appears from investigations on the influence of moisture, temperature, and sunlight on the formation of water-soluble arsenic that the rôle which atmospheric conditions play in arsenical injury to foliage is primarily a problem of plant physiology and specifically of changes in plant permeability, rather than of pure chemistry. The influence of hydrated lime, Kayso, and sulfur on the formation of water-soluble arsenic is shown in tabular form, with a suggestive chemical reaction explaining why so much more water-soluble arsenic was obtained when calcium carbonate was used. Results are presented with discussion of a study of arsenical burning and correctives.

Effect of mineral oil on foliage, J. M. Ginsburg (pp. 207, 208).—A study of the effects of mineral oils on foliage did not identify the causal agent of oil injury, but the fact that the highly refined oils proved to be much less toxic to foliage than the unrefined suggested that either the unsaturated or the aromatic hydrocarbon may be responsible for foliage burning.

Two new bacterial diseases, M. T. Cook (*Phytopathology, 15 (1925), No. 1, p. 55*).—A wilt disease of eggplant and a bacterial disease of cultivated Cosmos are reported as due to bacteria. The bacteria found in connection with the eggplant disease do not attack tomato, pepper, or tobacco. With Cosmos, a Fusarium is said to be usually associated with the bacteria, but it will not cause the disease.

Bacteriophagy and plant cankers [trans. title], W. P. Israilsky (*Centbl. Bakt.* [etc.], *2. Abt., 67 (1926), No. 8-15, pp. 236-242, pl. 1*).—From cancer tumors produced on *Beta vulgaris* with *B. tumefaciens* a bacteriophage was isolated which was scarcely affected by a temperature of 55° C., but which was inactivated at 70°. Particulars of the study of these organisms together are given.

The attentuation of plant viruses and the inactivating influence of oxygen, J. Johnson (*Science, 64 (1926), No. 1652, p. 210*).—The author reports having attenuated the virus of tobacco and other mosaics by heat. The plants soon after inoculation were placed in constant temperature chambers at a temperature between 35 and 37° C. for 10 days or more. At this temperature symptoms of mosaic were wholly or partially masked, and transfers of the virus from such plants showed that a very decided attenuation had occurred. The attenuated virus usually gave only mild mottling and little or no malformation as compared with marked symptoms of tobacco mosaic. It is believed that this attenuation can be obtained in varying degrees, depending upon the temperature exposure within certain limits. The author claims that the attenuated virus can be repeatedly transferred through tobacco plants without apparently altering the attenuated condition.

The virus was found to retain its vitality in soil for several months, the longevity being much shorter in sand or sandy soils than in heavier ones containing clay or organic matter. The variation is believed to be dependent upon oxygen relations.

Factors affecting certain properties of a mosaic virus, H. H. McKinney (*Jour. Agr. Research* [*U. S.*], *35 (1927), No. 1, pp. 1-12*).—In the study here briefly described as undertaken to predetermine the probable degree of reliability of certain contemplated investigations on mosaic of a cereal (winter wheat), the author used virus obtained originally from a young mosaic tobacco plant.

It was found that the temperatures at which the tobacco mosaic virus becomes inactivated depend on the concentration of the virus and the nature of the plant extract. Virus extract diluted 100 times with water was inactivated in 10 minutes between 82 and 84° C., the same virus undiluted being inactivated between 88 and 90°. Fluid extract from healthy cucumber plants seemed to have a more depressing effect on the potency of the virus than an equal amount of water or tobacco fluid. Virus diluted with water or juices of tobacco and cucumber lost potency more rapidly on standing than did undiluted virus extract, particularly when healthy cucumber extract was used. The first reduction in the potency of diluted virus extract does not always appear to be permanent. The nature of the reactivation may result from adsorption or from an actual increase in the number of virus particles not previously inactivated.

"The properties of viruses from plants of different species can not be adequately studied in a comparative way until the viruses can be purified, brought to a fairly uniform concentration, and studied in reasonably uniform dispersing media."

Quantitative and purification methods in virus studies, H. H. McKinney (*Jour. Agr. Research [U. S.], 35 (1927), No. 1, pp. 13–38, figs. 5*).—Experiments herein presented indicate that the virus of tobacco mosaic can be studied quantitatively by dilution and inoculation methods. The method suggested has been tested in connection with several problems, and the relative congruity of the virus concentrations in fractions obtained in a similar manner lends support to the method. Though accuracy depends upon several factors which are indicated as not being easily controlled, it is thought that the method offers a basis for the further improvement of quantitative methods. Data presented show that filtrates of virus extract tend to be low in virus concentration, and indicate that the filter slime, which is composed of suspensoidal and colloidal materials contained in the extracts, removes a considerable portion of the virus.

Preliminary experiments indicate that the concentration of the virus varies in plants grown under different conditions, in plants of different ages, and in different parts of the same plant; also that the concentration of virus in an extract is influenced by the methods used in preparing the tissue and in making the extraction. The chemical and physical behavior of extracts also varies in plants of different ages and in plants of the same age grown under different conditions.

It is believed that the methods of culturing and selecting the plant material, and the methods employed in making and manipulating the virus extracts, must be standardized as far as possible to insure reasonably uniform results.

Notes on the genus Aphanomyces, with a description of a new semiparasitic species, J. N. Couch (*Jour. Elisha Mitchell Sci. Soc., 41 (1926), No. 3–4, pp. 213–227, pls. 3*).—A species of Aphanomyces, closely related to *A. parasiticus* but differing in size of the oogonia and eggs and especially in growth habits, is described as new under the name *A. exoparasiticus* because of its habit of sending its haustoria around the threads when growing as a semiparasite on other molds. Experiments testing the range of the new species shows that it parasitizes all Phycomycetes but no Ascomycetes or Basidiomycetes. Spirogyra also is immune.

The developmental history of Cladosporium entoxylinum [trans. title], W. Himmelbaur (*Österr. Bot. Ztschr., 75 (1926), No. 1–3, pp. 17–29, figs. 9*).—The life cycle of *C. entoxylinum* is detailed in its relations.

On the relationship between Melampsora on Salix pierotii Miq. and Caeoma on Chelidonium majus L. and Corydalis incissa Pers., T. Matsumoto (*Bot. Mag. [Tokyo], 40 (1926), No. 470, pp. 43–47, figs. 2*).—This work, continuing that previously noted (E. S. R., 44, p. 55), supplies data from further studies including inoculation and tabulated results, concluding with a technical description of the new species *Melampsora chelidonii-pierotii*.

Factors affecting the development of Melampsora lini (Pers.) Desm., H. Hart (*Phytopathology, 15 (1925), No. 1, pp. 53, 54*).—The temperature, light, and moisture requirements for the development of spores of *M. lini* were studied, and it was found that the aeciospores and urediniospores germinated at temperatures ranging from 0.5 to 27° C., while uredinia are formed at temperatures ranging from 7 to 30°. Teliospores were found to require a rest period which could not be shortened artificially. Rust from common flax infected *Linum rigidum* but not *L. lewisii*, while that from *L. lewisii* did not infect common flax.

On the identity of Rhizoctonia lamellifera and Sclerotium bataticola, W. Small (*Brit. Mycol. Soc. Trans., 10 (1926), pt. 4, pp. 287–302, pl. 1*).—Since making the original study (E. S. R., 56, p. 752) of a fungus which was then described as *R. lamellifera* n. sp., the author has investigated further occurrences of this fungus and has studied in this connection a fungus associated with a hot weather wilt of *Phaseolus vulgaris* and identified with *S.*

bataticola. An account of the occurrence of this form has been noted (E. S. R., 55, p. 543). This fungus has proved, it is stated, to be indistinguishable in culture from the form designated as *R. lamellifera*, and this name is therefore withdrawn in favor of the name *S. bataticola*. One main purpose of this paper is to record a large increase in the host range of this parasite, which is now widespread in Uganda, and the list of hosts has been extended to include *Coffea arabica*, *Erythrina indica*, *E. umbrosa*, and *E. velutina*, *Albizzia moluccana* and *A. stipulata*, *Theobroma cacao*, *Sesbania* sp. (*S. punctata*?), *Codiaeum* sp., *Eucalyptus* sp. (*E. globulus*?), *Cupressus macrocarpa* and *C. benthami*, *Callistephus* sp., an unnamed vetch from Palestine, and probably *Pithecolobium saman*. An account is given of the fungus in some of these relations.

On the occurrence in Britain of the conidial stage of Sclerotinia cydoniae Schell, H. Wormald (*Brit. Mycol. Soc. Trans., 10 (1926), pt. 4, pp. 303–306, pl. 1*).—After discovering (E. S. R., 45, p. 822) the conidial form of the medlar fungus (*Sclerotinia mespili*) and after noting the occurrence elsewhere on *Cydonia vulgaris* of a closely related fungus, the author searched for such a fungus on quince trees. This was found in 1925 at East Malling Research Station and at Wisley. The dimensions of the conidia are said to be somewhat greater than those indicated in the description given by Schellenberg, as noted in a later publication by Wormald (E. S. R., 49, p. 250).

Alternate hosts of Puccinia coronata Corda, S. M. Dietz (*Phytopathology, 15 (1925), No. 1, p. 54*).—A summary account is given of species of Berchemia, Ceanothus, Zizyphus, and Rhamnus as alternate hosts of *P. coronata* (E. S. R., 56, p. 446).

Physiologic specialization and mutation in Helminthosporium sativum, J. J. Christensen (*Phytopathology, 15 (1925), No. 12, pp. 785–795, figs. 4*).—Of the numerous forms of *H. sativum* the author studied 37 in detail, and he states that they can be distinguished in culture by the rate of growth, relative amounts of submerged and aerial mycelium, nature of the mycelial growth, zonation, conidia production, density of conidial clusters, mycelium color, and the readiness with which the forms mutate. All forms can attack the roots and basal stems of wheat and barley, some being very virulent, others slightly so. There is in general a correlation between virulence on wheat and that on barley.

Asexual mutation occurs freueqntly in some forms of *H. sativum*. Mutants arise abundantly from some forms in artificial culture as wedge- or fan-shaped sectors. The mutants bred true when propagated from either spores or mycelium. Some forms mutate readily. Mutation was observed in forms from England, Australia, Africa, Argentina, Serbia, Canada, and points in the United States. Reversions which occur are always in the form of sectors. Mutants differ from the parents both in morphological characters and in pathogenicity, and may be more or less virulent than that of the parents.

The inheritance of resistance to Puccinia graminis avenae, S. M. Dietz (*Phytopathology, 15 (1925), No. 1, p. 54*).—The reactions and segregations are shown of the F_1, F_2, and F_3 generations of crosses between eight pure line varieties of oats.

Studies in rust resistance, E. B. Mains (*Jour. Heredity, 17 (1926), No. 9, pp. 313–325, figs. 7*).—Results are summarized of cooperative studies on a number of rusts since 1918.

It is concluded that rust resistance probably is to be found in some form or other among lines of the majority of host species. The reaction of various lines in the same host species or the same variety suggests that a number of distinct factors may cause the same manifestation of resistance. It is regarded as important that this be kept in mind in studies of inheritance of resistance, and

especially in studies concerning the nature of resistance. The host studies should follow lines as far as possible genetically pure for resistance to a pure culture of the rust in order to obtain uniform results.

Infection of barley by Ustilago nuda through seed inoculation, W. H. TISDALE and V. F. TAPKE (*Phytopathology, 15 (1925), No. 1, p. 59*).—Investigations were made of a number of varieties of barley in which the dehulled seed was inoculated with spores of *U. nuda* and a high percentage of the plants was infected with loose smut.

Rye resistant to leaf rust, stem rust, and powdery mildew, E. B. MAINS (*Phytopathology, 15 (1925), No. 1, pp. 58, 59*).—The author reports that two plants of Abruzzes rye highly resistant to leaf rust, *Puccinia dispersa*, were also practically immune to powdery mildew, *Erysiphe graminis secalis*. Selfed and open-pollinated seed were studied for susceptibility to leaf rust and mildew and the most promising of these for susceptibility to stem rust, *P. graminis secalis*. All types of susceptibility from high resistance to high susceptibility were found. Selfs and crosses were made of this material, and from studies it appeared that resistance to each disease was dominant. Plants showing resistance to one or more diseases and susceptibility to others are believed to indicate that resistance to each is due to separate factors independently inherited.

Some experiments on the control of bunt in wheat by copper carbonate and other chemicals, including data on the growth and yield of treated and untreated grain, K. SAMPSON and D. W. DAVIES (*Welsh Jour. Agr., 2 (1926), pp. 188–212*).—Results are given of five experiments carried out in the seasons 1923–1925 in a search for an inexpensive, adherent, adequately controlling, fungicidal powder to combat wheat bunt without detriment to germinability or to subsequent development.

Copper dusts controlled but did not eliminate wheat bunt (*Tilletia tritici*). The best control was given by dehydrated copper sulfate and high-grade copper carbonate (50 per cent copper) at 2 oz. per bushel of grain (lower percentages 4 oz. per bushel). Uspulun and Germisan gave control about equal to that from good copper carbonate. Formalin at 1:320 and 1:480 was not quite so effective, and a stronger solution injured the grain.

Bunt control gave better growth in the field, improved tillering, and increased grain yield, producing in three cases increases ranging above 100 per cent. The results are thought to indicate that *T. tritici* injures wheat, besides replacing healthy with bunted grain. Further experiments are in progress. A possible stimulating effect is suggested.

Covered smut (Tilletia tritici) in wheat: The value of different control methods, G. F. PUTTICK (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 6, pp. 616–622, figs. 4*).—Results are presented of experiments at the Potchefstroom School of Agriculture and Experiment Station with a view to determining the effects of modern as compared with older seed treatments for covered smut or bunt of wheat, which is said to be widely distributed in South Africa. All seed grain was first artificially dusted with spores of *T. tritici*, and was then treated, comparatively, with different preparations, which are indicated.

It is regarded as important to use a disinfectant which remains on the surface of the grain after planting. Both copper sulfate and copper carbonate dust satisfy this requirement. The latter is regarded as superior to any other treatment, and it is on trial for use against smuts of kafir, oats, and barley.

Copper-carbonate seed treatment for stinking smut of wheat, V. F. TAPKE and F. C. MEIER (*U. S. Dept. Agr. Misc. Circ. 108 (1927), pp. 4, figs. 3*).—This circular presents briefly the advantages of the copper carbonate treatment

for wheat stinking smut, directions for its use in a simple and inexpensive manner, and cautions appropriate to the poisonous character of the chemical.

Fungicidal dusting for control of wheat stinking smut [trans. title], A. KRAFT and W. STRAIB (*Pflanzenbau [Berlin], 2 (1925), No. 7, pp. 97–103*).—A tabular account with discussion is given of tests with various fungicidal sprays and dusts in use or offered for control of wheat stinking smut. Some of these are proprietary. A short bibliography is given of related contributions, mostly recent.

Action of certain fungicides on seed wheat and on smut (Tilletia levis) [trans. title], A. PETIT (*Ann. Serv. Bot. [Tunis], 2 (1925), No. 2, pp. 89–162, figs. 10*).—The systematic account here presented, including an historical review, results of experimentation and their interpretation, particular and general conclusions, and a list of about 60 bibliographical references, emphasizes the statement that the plan of dusting seed wheat with substances having high fungicidal efficiency unites with advantageous conditions of easy employment a degree of security equal to that of solutions as regards protection from smut.

Vrotpootjie or take-all of wheat, V. A. PUTTERILL (*Union So. Africa Dept. Agr. Jour., 8 (1924), No. 6, pp. 602–612, figs. 6*).—Attention is called to the presence of wheat take-all, foot rot, or vrotpootjie, due to *Ophiobolus cariceti*. These names are recommended for use with this disease only, to distinguish it from other fungus diseases of somewhat similar nature, for one of which the name Helminthosporium foot rot is referred to as appropriately distinctive. Take-all is described in its various aspects.

Influence of balanced nutrient supply on susceptibility of corn plants to Gibberella saubinetii (Mont.) Sacc., G. N. HOFFER and J. F. TROST (*Phytopathology, 15 (1925), No. 1, pp. 59, 60*).—The relative extents of injury to three strains of corn by infection with *G. saubinetii* were varied by supplying young plants of each strain with controlled supplies of mineral nutrients added to washed sand. With plants grown under conditions where either phosphate or potash was deficient, the injuries induced by *G. saubinetii* were markedly different for each respective strain.

Tuckahoe on maize, F. A. WOLF (*Jour. Elisha Mitchell Sci. Soc., 41 (1926), No. 3–4, pp. 288–290, pls. 2*).—In the spring of 1925 the author received from Albemarle, N. C., a collection of 11 tuckahoes, 8 on roots of *Zea mays* and 3 on roots of *Pinus* spp. Like sclerotia are said to have been found previously on pines in North Carolina, on citrus in Florida, and on sumac in Arkansas. Fruit bodies of the Poria type have been developed on each of 4 tuckahoes from corn and on 2 from pine. Artificial cultures made from plantings of sclerotial tissues have given rise to sporophores. The fungus is thought to be identical with *P. cocos*.

The cause of cotton wilt in India, S. L. AJREKAR (*Jour. Indian Bot. Soc., 5 (1926), No. 1, pp. 1–8*).—The author reports successful inoculations of cotton plants with *Fusarium* sp. isolated from wilted cotton plants obtained at Nagpur and Dharwar. Objections are presented to the acceptance of the theory that cotton wilt is due to the accumulation of iron and aluminum salts.

Studies on the tipburn disease of lettuce, A. G. NEWHALL (*Phytopathology, 15 (1925), No. 1, p. 58*).—An investigation was made of the relation of certain fertilizers, temperature, sunshine, and soil moisture to tipburn under field and greenhouse conditions. It is concluded that the disease is not of bacterial origin, but that fluctuations in temperature and moisture supply, particularly in the presence of readily available potassium and nitrogen, induce tipburn. Slowing down the rate of growth by leaving potash out of the fertilizers and by root pruning or deep cultivation at the proper time also reduced

the amount of disease. Slow-growing varieties of head lettuce were found to be less subject to tipburn than others.

"Pink-root" of onions caused by Phoma sp., H. N. Hansen (*Science, 64 (1926), No. 1665, p. 525*).—A disease of onions due to *Phoma* sp. is described and compared with similar diseases due to *Fusarium* spp. It is claimed that if roots are cultured they still remain turgid and firm, although of a distinct pink coloration. If roots in this condition are sterilized with corrosive sublimate, only a single fungus belonging to the genus Phoma is obtained. A brief description of the fungus is given.

Typical pink root symptoms, a diffuse pink color, followed by shrivelling of invaded parts, were readily produced in roots of onion seedlings grown in sterilized soil inoculated with the organism.

Onion smut (*Scot. Bd. Agr. Leaflet 55 (1926), pp. 3, pl. 1*).—Onion smut (*Urocystis cepulae*), said to have been known in the United States since 1869 and in Great Britain for 12 to 15 years and probably present longer in north England and south Scotland, attacks all varieties of onions or leeks. A description, modes of spreading, and control measures are briefly outlined. Change of crop, transplanting, and treatment of the drill with formalin are the measures recommended. A convenient makeshift method for carrying out the formalin treatment is outlined.

Soil-inhabiting fungi parasitic upon the pea plant and their relation to disease, F. R. Jones (*Phytopathology, 15 (1925), No. 1, p. 59*).—A survey of the soil-inhabiting fungi parasitic on the pea plant has been made, and three groups of fungi are recognized. The first consists of those species which attack chiefly the growing ends of shoots and roots. The most important members of this group are *Corticium vagum* and two species of Pythium. The second group includes species entering chiefly the base of the stem, largely species of Fusarium. The third group consists of two species entering and traversing extensively the primary cortex of roots, a mycorrhizal fungus and *Aphanomyces euteiches*. The latter is the most widespread cause of destructive root rot.

Parasitic nemas on peanuts in South Africa, G. Steiner (*Centbl. Bakt. [etc.], 2. Abt., 67 (1926), No. 16–24, pp. 351–365, pls. 4*).—An account is given of a study undertaken by the author at the instance of N. A. Cobb of diseased peanut plant material and alcoholic specimens of nematodes. The animal part of this material consisted of 688 individual nematodes, which were classified into 10 species of 6 genera. Nematodes considered as new species include *Rhabditis microbursaris*, *Aphelenchus chameloocephalus*, and *Tylenchus cylindricaudatus*. The last named, a description of which, from the files of N. A. Cobb, is given, is thought to be, possibly, quite injurious, even alone, but probably more so in association with *Cephalobus elongatus*. Other forms discussed or listed are *C. persegnis*, *Acrobeles lenta*, *Acrobeles* sp., *T. filiformis*, *Aphelenchus* (*Paraphelenchus*) *pseudoparietinus*, and *Monohystera* sp.

Varietal tests of peanut (Arachis hypogaea) for wilt resistance, C. Hartley (*Phytopathology, 15 (1925), No. 1, p. 55*).—Tests conducted in Java are said to indicate that the African, South American, and North American varieties of peanut, particularly Valencia, were more susceptible at Buitenzorg than the best Javanese varieties.

Sour sickness of potato plants [trans. title], [R.] Schander and [G.] Schweizer (*Pflanzenbau [Berlin], 2 (1925), No. 7, pp. 103–106, figs. 3*).—A potato plant sour sickness, or so-called false leaf roll, was observed in June, 1925, in the course of irrigation and soil-moisture studies, cultivated plants remaining apparently normal. It is not known whether this condition presents a parallel to hereditary leaf roll.

Study on sugar cane mosaic, A. Bonazzi (*Science, 64 (1926), No. 1665, pp. 529, 530*).—A brief account is given of studies of the susceptibility of different cane varieties to mosaic. The procedure adopted consisted of obtaining from the field mature canes which were free from disease, as indicated by the appearance of the leaves and history of the plants. After dividing each cane into as many pieces as there were internodes, the sections (one from the terminal and another from the basal portion of the stalk) were separated and planted to serve as controls. The remaining sections of cane were inoculated by placing in them a small piece of fresh apical bud tissue obtained from an infected cane. By this method it was found that the infective agent of cane mosaic can be transmitted to the tissue of the apical bud and there remain active for several days, even though the tissue is not in a process of active growth.

Rhizoctonia disease of tobacco in Deli [trans. title], S. C. J. Jochems (*Bul. Deli Proefsta. Medan, No. 21 (1926), pp. 13, pls. 3, figs. 2; Eng. abs., p. 13*).—A tobacco damping-off was recorded in 1925 as confined on one estate to seed beds and on two other estates to field tobacco in a more serious form. Microscopic, cultural, and inoculation tests showed the disease to be caused by a Rhizoctonia, one strain attacking on the seed beds, the other in the field, and the two strains also differing widely as to both cultural and morphological characters. *Portulacca oleracea* was attacked by the field Rhizoctonia, and cross inoculations both ways gave positive results. The loss at present is not severe.

Chlorosis of trees and shrubs (*Idaho Sta. Bul. 149 (1927), p. 14*).—It has been definitely established that chlorosis is associated with high calcium carbonate soils, and that such soils prevent the proper assimilation of iron even when considerable total iron is present. Experiments are now under way to determine whether incorporating iron sulfate in the soil around the trees will be successful. Another method consists in placing iron sulfate in contact with exposed roots of the trees.

Investigations on chlorosis of fruit trees.—I, The composition of apple leaves in cases of lime-induced chlorosis, T. Wallace and C. E. T. Mann (*Jour. Pomol. and Hort. Sci., 5 (1926), No. 2, pp. 115–123; also in Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1925, pp. 25–36*).—This work on fruit tree chlorosis, undertaken by the authors as a section of projected studies on the wider problem of The Nutrition of Fruit Trees, was limited to the study of so-called accidental chlorosis, i. e., due to environmental factors, such as particular soil conditions. The work up to the present report had proceeded along three main lines, namely, the occurrence of chlorosis in relation to soil conditions; chemical investigations on the foliage of chlorotic trees; and experiments with a view to controlling the condition in the field. The present communication presents certain results which have been obtained under the second of these aims.

"The results of an investigation on the composition of green and chlorotic leaves in some typical cases of lime-induced chlorosis of apple are reported. Soil data are presented to show the nature of the soil conditions which were conducive to the cases of chlorosis considered. Data on the composition of green and chlorotic leaf samples are provided, from which it is possible to make comparisons under various conditions. The data show that the salient differences in the composition of green and chlorotic leaves in all cases are as follows: (1) Green leaves contain higher percentages of dry matter, and lower percentages of ash in the dry matter than do chlorotic leaves. (2) The calcium content of the ash of the green leaves is much higher than that of chlorotic

leaves. (3) The percentages of potassium and sodium, especially potassium, are much higher in the ash of chlorotic leaves than in that of green leaves. (4) The differences in the amounts of magnesium, iron, aluminum, phosphorus, and silica are not so definite in character as in the cases of calcium, potassium, and sodium."

The importance of removal of mummies and affected fruit in apple bitter-rot control, R. H. HURT (*Phytopathology, 15 (1925), No. 1, p. 56*).—In an orchard of Yellow Newtown apples all mummies in one block of 5 trees were removed during the dormant season. In a second block of 15 trees, affected fruits and all mummies observed were removed at weekly intervals during July and August. Three trees served as controls. All the trees received a single application of Bordeaux mixture on July 17. At harvest where the mummies were removed the percentage of bitter-rot was 4.81, where the mummies and affected fruits were removed the percentage of bitter-rot fruit was 0.86, and for the controls it was 49.7.

The seasonal development of apple scab, F. J. SCHNEIDERHAN (*Phytopathology, 15 (1925), No. 1, p. 57*).—Studies of the incidence of scab on apple fruits during 1924 are said to have shown three infection cycles during the early season, cessation of spread in midsummer, and renewed activity in the fall.

Further studies of the seasonal development and control of apple scab and cherry leaf spot, G. W. KEITT and L. K. JONES (*Phytopathology, 15 (1925), No. 1, pp. 57, 58*).—Investigations at Sturgeon Bay, Wis., of the ascospores of *Venturia inaequalis* showed that the spores were being discharged when the cluster buds of the apple began to open. Infection began in very early stages of unfolding of cluster buds, about 20 days before the "pink" spray was applied. Although ascospore discharge of the cherry leaf spot fungus began May 14 and discharges occurred frequently thereafter, no disease was observed until June 25, and it was found that this infection was occasioned by ascospores discharged June 15.

Frequencies of ascospores of Venturia inaequalis in orchard air, G. W. KEITT and L. K. JONES (*Phytopathology, 15 (1925), No. 1, p. 57*).—Orchard air drawn through a filter showed that ascospores were caught at intervals from May 6 to June 29, the maximal occurrence being recorded on May 13 when during a rain they were caught through a 4-hour period at the average rate of 289 per cubic foot of air. The major portion of the season's discharge occurred before the blooming period.

Rainfall in relation to ascospore discharge and infection in Venturia inaequalis, F. J. SCHNEIDERHAN (*Phytopathology, 15 (1925), No. 1, p. 56*).—Ascospore discharge studies of the apple scab fungus have shown that the discharges occurred only during rainfall, and the majority of rains within the period of discharge were accompanied by spore discharges. As a result of a study of three years, May rainfall is believed to determine to a high degree the intensity of infection for the season.

Study of Bartlett pear black-end undertaken in California, M. J. HEPPNER (*Science, 65 (1927), No. 1681, pp. 280, 281*).—A preliminary account is given of a disease of the Bartlett pear, the investigation of which has been undertaken. This disease is claimed to be physiological in nature and has caused heavy losses in practically all pear sections of the State. The early stages of the disease are said to be evident while the fruit is quite small, the epidermis around the calyx end becoming shiny and tight in appearance. Coincident with these manifestations, the calyx lobes are forced out so that they appear to be set on top of a peak. As the fruit develops the calyx end either turns black, involving the epidermis as well as the flesh, or else it becomes very hard and gritty. In either case the fruit has no commercial value.

Preliminary investigations are thought to indicate that the abnormal fruit development took place on trees produced on the Japanese rootstock, *Pyrus serotina*, except in a few scattered instances where the French rootstock, *P. communis*, was used.

Presence of the European brown-rot fungus in America, W. N. Ezekiel (*Phytopathology, 15 (1925), No. 1, p. 55*).—The author reports isolations from fruits from California and the spur-blight Monilia from Oregon as the true European brown-rot fungus, *Sclerotinia cinerea*. *Monilia oregonensis* is considered probably synonymous with *S. cinerea*. The latter fungus is expected to be of slight economic importance in this country as compared to *S. americana*.

Arsenical injury of the peach, C. M. Haenseler and W. H. Martin (*Phytopathology, 15 (1925), No. 6, pp. 321–331, figs. 4*).—Observations made on a form of peach twig damage which appeared in New Jersey in 1922, 1923, and 1924 show that the injury occurs mainly as a leaf burning which frequently results in premature defoliation, as necrotic areas at the older nodes of the new growth, or as cankers on wood one year old, which cause a bark splitting and gummosis.

Tests show that atomic sulfur, flowers of sulfur, and lime alone cause no injury, but that with powdered lead arsenate (1.5 lbs. to 50 gal. of water), or the lead arsenate alone, severe injury is caused. In mixtures, injury occurred only when the lime content was appreciably reduced below or the lead arsenate increased above the amounts generally recommended. Injury was caused by dry-mix 8–4–0.5–50 with 1.5 lbs. of lead arsenate, though no injury was caused by self-boiled lime sulfur 8–8–50 with 1.5 lbs. of lead arsenate. In dry-mix, increasing the lead arsenate to 2.5 lbs. or reducing the lime to 2 lbs. made the mixture more toxic. Weak trees were most subject to spray injury. Some injury was caused by sprays applied early in the season.

The effect of sodium silicofluoride sprays on the peach and on the control of bacterial spot, H. W. Anderson (*Science, 65 (1927), No. 1671, pp. 16–18*).—The results of experiments carried on in 1926 are said to have confirmed those in 1925, in which it was found that sodium silicofluoride in a dilute solution (2 lbs. to 50 gal. of water) had a decided effect in checking the bacterial spot of peach on the leaves. In 1925 no fruit was formed, but the 1926 experiments showed the effect not only on the fruit but on the foliage.

No injurious effect was noted on the fruit until shortly before harvest, and even then no burning or marking of the fruit could be seen. It was observed, however, that the sprayed plats ripened from four to six days ahead of the unsprayed ones, and in addition the fruit had a higher color and was somewhat smaller. At the tip of the fruit there was an area varying in size and shape, with a color range from dark green to yellowish green, the spots being very conspicuous in contrast to the normal color of the fruit. The taste of the entire fruit was said to have been insipid, and in some cases rather bitter. The effect of the sprays on the leaves varied throughout the season, but on the whole little injury was observed aside from rather severe burning at the tips and on the edge in the case of some trees.

At Urbana, Ill., the effect of the control of bacterial spot was noted on trees sprayed at weekly intervals, starting June 21 and continuing until July 26. Almost perfect control of the disease on the fruit was secured. At Ozark, Ill., the control of the disease on the leaves was not as successful as that on the fruit.

The author concludes that it is not safe for growers to use any spray containing sodium silicofluoride until further experiments are made as to the effect of different climatic conditions on the amount of injury, and also that further investigations are necessary on the chemical changes which take place after the material is applied to the trees.

[Cranberry] rot control, C. S. Beckwith, B. F. Driggers, and C. D. Jones (*New Jersey Stas. Rpt. 1926, pp. 218–221*).—It is stated as the result of tests that 5–5–50 Bordeaux soap applied five times gave control of cranberry rot, copper lime dust being much less efficient.

Longevity of the uredospores, teliospores, and sporidia of Cronartium ribicola, P. Spaulding and A. Rathbun-Gravatt (*Phytopathology, 15 (1925), No. 1, p. 58*).—Studies made of the longevity and viability of the teliospores and sporidia of *C. ribicola* on a number of species of Ribes showed that their longevity period varied from 19 days for one collection of *R. rotundifolium* to 87 days for *R. nigrum*.

Three raspberry diseases, R. V. Harris (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), I, Gen., pp. 64–70, pls. 2*).—In the raspberry classification studies conducted by Grubb (E. S. R., 48, p. 737), it was found that comparison of varieties was hampered by the presence of diseases. This fact necessitated a study of the pathology of the raspberry leading up to the present investigation, which was begun in the winter of 1923, and more particularly to a study of one disease, the raspberry blue stripe wilt, on which a report has been made (E. S. R., 56, p. 654). Work was subsequently commenced on a raspberry mosaic (the severity of which is said to be increasing in some varieties) of causation at present unknown, and on a cane spot disease constantly associated with a fungus which is said to be similar to one which is parasitic in America. This cane spot is described.

Control measures under discussion here refer to conditions in new plantations and to those in established plantings. Tabular comparison is presented of the chief distinguishing symptoms of these three raspberry diseases.

Fasciation of dahlia, E. F. Smith (*Jour. Heredity, 17 (1926), No. 4, p. 112, figs. 4*).—A brief description accompanying this frontispiece states that the plant in question was a fasciated double pink dahlia, a much branched, very leafy plant, and that it had many floral axes stretched 3 to 6 in. and covered with green bracts. No normal flowers were present, and only occasionally a few pink petals. The plant differed visibly otherwise only in having an injured main axis with a cavity extending through several internodes. Into this cavity rain water had penetrated, and in this medium a mixed bacterial growth had developed. The fasciation is attributed to the action of ammonia and other bacterial by-products. One of these fasciations had as many as seven centers at the apex. Types of the three sorts of colonies of bacteria on poured plates are shown.

A Peridermium new to the northeastern United States, H. H. York (*Science, 64 (1926), No. 1664, pp. 500, 501*).—The author reports finding during the first week of June, 1925, a gall-forming Peridermium on the Scotch pine, *Pinus sylvestris*, near Woodgate, N. Y. During the summer a careful search was made for alternate hosts of the Peridermium, but none were found, and it is believed to be undoubtedly autoecious in that region. The galls are said to be quite similar in shape to those produced by *Cronartium cerebrum*, but the aecia are not cerebroid.

Further investigations indicated that this Peridermium had been present in the locality for at least 30 years, and that the amount of infection had increased rather rapidly since 1920.

Some undescribed fungi on sourwood, Oxydendrum arboreum (L.) DC., F. A. Wolf (*Jour. Elisha Mitchell Sci. Soc., 41 (1925), No. 1–2, pp. 94–99, pls. 2*).—Sourwood (*O. arboreum*), said to be of economic importance throughout the coastal plains of the Carolinas as a source of honey, is subject to infection by a number of fungi. The author notes three forms of these which are said

to differ from any previously described for this and other ericaceous hosts. These species are described as new under the names *Sphaerella caroliniana*, *Sphaerulina polyspora*, and *Venturia oxydendri*.

ECONOMIC ZOOLOGY—ENTOMOLOGY

A comparison of the animal communities of coniferous and deciduous forests, I. H. BLAKE (*Ill. Biol. Monog., 10 (1926), No. 4, pp. 148, pls. 16*).—In this work the author reports upon the animal ecology of the upper slopes of Mount Ktaadn, the steep slide animal community, animal ecology of Maine pine-hemlock forest, and animal ecology of deciduous forest in winter. A bibliography of four pages is included.

Birds of Denmark, E. L. SCHIØLER (*Denmarks Fugle. Copenhagen: Glydendalske Boghandel, 1925, vol. 1, pp. 552, pls. 98, figs. 187; 1926, vol. 2, pp. 338, pls. 87, figs. 101*).—Chapter 1 of volume 1 deals with the ornithological literature of Denmark (pp. 11–197), and chapter 2 with the structure (pp. 199–226). Chapter 3 (pp. 227–255) consists of a general discussion with lists of Danish birds (pp. 227–243) and an account of land birds by H. Winge (pp. 244–255), and chapter 4 treats of the Anseriformes (pp. 257–523).

Chapter 1 of volume 2 deals with the ornithological literature of Greenland (pp. 11–30), chapter 2 with a discussion and lists of the birds of Greenland (pp. 33–59), and chapter 3 with the ducks of the subfamily Fuligulinae (pp. 61–319).

Report of the department of biology, T. C. NELSON (*New Jersey Stas. Rpt. 1926, pp. 103–113, pl. 1, figs. 2*).—This is a report of the work of the year with the oyster, in which especial attention is given to the relation between temperature and spawning and the effects of weather conditions upon the larvae. The report is presented under the headings of weather and water conditions, temperature and spawning of the oyster, further studies of the occurrence and behavior of oyster larvae, the vertical distribution of oyster larvae, setting, the death rate of the 1925 oyster set, and miscellaneous.

The feeding of organisms in pure culture to young oyster spat, by G. W. Martin, has shown that some have a distinctly higher food value than others, as reported in a bulletin previously noted (E. S. R., 57, p. 256). A continuous recording of the water temperatures of Barnegat Bay correlated with the spawning of the oyster has shown spawning to occur approximately 160 degree hours after the temperature has reached 68° F. Oyster larvae appeared in numbers by June 4 and began to set July 14, as high as 3,000 spat being found on some test shells down 24 hours. Further studies of the vertical distribution of oyster larvae showed that the veligers are most numerous in the region of less dense water, which lies immediately above the water of highest saline content that creeps up along the bottom of the bay with the flood tide.

[Report of work in entomology at the Idaho Station] (*Idaho Sta. Bul. 149 (1927), pp. 27–29*).—In the course of control work with *Anuraphis cardui* on prunes and *Aphis pomi* on apples conducted in 1925 and 1926, a complete control of *A. cardui* was obtained through the use of a mixture containing 0.5 per cent of pure oil and nicotine sulfate (40 per cent) at the rate of 1 part to 4,265 parts of water. The use of these materials against the apple aphid was not entirely effective when the nicotine sulfate was used at a strength of less than 1 : 3,200. Sprays containing 2 per cent of oil were ineffective against *A. cardui* when not used in combination with nicotine, and seven applications of 1 per cent oil at 1-day intervals were ineffective in killing the apple aphid. One-half per cent oil did not injure prune foliage or fruit,

but pronounced damage was done by 1 per cent oil and severe injury resulted from the use of 2 per cent oil.

Studies of the beet leafhopper, commenced in 1925 and continued in 1926 in cooperation with the U. S. D. A. Bureau of Entomology, resulted in the finding of this pest in all parts of the State regardless of elevations or proximity of host plants to sugar beets. It appears, however, that it may be found in some communities in injurious numbers only during so-called years of dispersal. These years of dispersal are apparently dependent on climatic conditions.

A year of life cycle studies of the codling moth conducted in southern Idaho was completed, it being learned that there may be a heavy third brood. Oil sprays used as ovicides gave evidence of being quite effective, although further work is necessary to determine whether their use is practicable. Eggs laid on oil-sprayed foliage hatched much less freely than when deposited on nonsprayed foliage even when laid a week after oil was applied. A small orchard was kept practically free from codling moth larvae as long as 1 per cent oil sprays were applied at 10-day intervals. Repeated use of 1 per cent oil sprays caused injury to certain varieties, and more knowledge is needed concerning the effect of certain oils on plants.

The Colorado potato beetle, which appeared in a commercial field in southern Idaho in 1924, was stamped out, as shown by examinations made in 1925 and 1926. A second outbreak in 1925 in a different locality was similarly handled.

Investigations of the fruit tree leaf roller continued in 1926 led to the determination that oil sprays containing 7 per cent of oil were effective in killing the eggs when applied before hatching time and that by their use commercial control can be obtained. A report of the investigations by Wakeland has been noted (E. S. R., 54, p. 56).

All experiments to date are considered to indicate that the San Jose scale can be controlled effectively by applying dormant oil sprays of 3 per cent content.

Notes are also given on onion thrips, wireworms, and oil sprays. Three insects not previously known to occur in Idaho that may prove to be of economic importance were discovered during the past year, namely, *Mineola scitulella* and the eye-spotted bud moth which injured prunes, and the clover seed midge, *Dasyneura leguminicola*, which was found to have a rather wide distribution.

Report of the division of entomology, F. N. WALLACE ET AL. (*Ind. Dept. Conserv. Ann. Rpt., 8 (1926), pp. 32–63*).—This is a somewhat extended report of the occurrence of the economic insects of the year and control work conducted; also an account of the apiary inspection.

[Entomological work at the New Jersey Stations] (*New Jersey Stas. Rpt. 1926, pp. 14–17, 18, 151–254, pls. 5, figs. 10*).—This material consists largely of the report of the department of entomology (pp. 151–254), by T. J. Headlee. A list, with the locality and date, is first given of insects and other pests received from correspondents during the year, arranged alphabetically by order, and data supplementary to the correspondence are included. Under the heading of investigations the author sets forth some general conclusions relative to the relation existing between climate and insect activity. A brief summary is given of a study made by W. Rudolfs of the body moisture, fats, and nitrogen occuring in the eastern tent caterpillar throughout its life cycle, a report of which has been noted from another source (E. S. R., 56, p. 757).

In experiments on the timing of sprays for control of the side worms of the codling moth, 100 apparently healthy hibernating larvae were collected and placed in a screen-wire bottom wooden box which was painted white and

hung to a limb of an average apple tree in an orchard typical of the region. Each larva was inclosed in a small glass vial plugged with rolled cotton. At least one of these cages, and not infrequently more, were maintained within the limits of a single county under the care of the county agricultural agent. The observations showed that there always came a time when the curve of emergence exhibited a sudden and large upward rise. When this rise made its appearance growers were advised to begin spraying for the side worms. Descending adult larvae of the first brood were collected from burlap bands, each in its own glass vial, plugged with rolled cotton, and placed as before in the codling moth cage. Soon after the emergence of the second brood of moths began, evidences that a large upward rise in the curve was due would appear, and as soon as these evidences were detected the growers were advised to make spray applications for the side worms of the second brood. This scheme of timing seems to have resulted in the establishment of quite satisfactory control of the side worms of the codling moth. However, the finding of codling moth adults in bait pans used for catching adults of the oriental peach moth suggested that the bait pans might be used as an indicator, and this led to a comparison being made in five localities of these two methods and the thermal constant method as reported upon by Glenn in Illinois (E. S. R., 47, p. 852; 49, p. 54). Data relating to the codling moth cage record and bait pan records at Glassboro and dates based on thermal constants for 1926 are reported in tabular form. The results obtained led to the conclusion that the thermal constant used in conjunction with the codling moth cages forms a good indicator of the time when spraying for the side worms of the first brood should take place. The bait pan is chiefly important where the codling moth infestation of previous years has been large. In control work in an area where the infestation on unsprayed fruit does not exceed 50 per cent of the picked fruit, the thermal constant and the codling moth cage become extremely important, since, as a rule, one thorough spraying resulting in a coating of the fruit, applied immediately after the time of maximum emergence in the first brood and just previous to the maximum emergence in the second brood, effects a satisfactory control of side worm injury of each brood.

Reference is made to control work at Glassboro, where a group of apple growers with holdings involving 1,376 acres effected a simple organization and conducted spraying operations under the direction of the station entomologist. As a result the condition of the fruit on June 30 was far freer from worms than for the past several years. The plan for treatment of these orchards is described at some length.

A report on investigations of the oriental peach moth (*Laspeyresia molesta* Busck) for 1925, by L. A. Stearns, deals with insectary life history studies; life history on caged peach trees; miscellaneous field observations on life history; larval development in the orchard, conditions of infestation, and parasitism; attractive baits; and control studies, including cultivation and spraying experiments. The studies of larval development in the orchard and the conditions of infestation by the peach moth were made in six different localities in the State and the results are given in graph form. A list is given of 21 primary parasites of the peach moth that were reared in 1925. A species of Macrocentrus (probably *ancylivora* Roh.), thought to be a parasite of the strawberry leaf roller, was found to be very prevalent during 1925, and in 1926 appeared to have been responsible for the enormous reduction in the injury done by the peach moth. Studies of the peach moth baits have not indicated that the bait and trapping method will serve for purposes of control, but will, however, show when the moth is present. A study of the relative value of

disking, plowing, and combined plowing and disking for the destruction of overwintering oriental peach moth larvae on the ground under the peach tree has shown that in soils where the disk can penetrate to the depth of 4 to 5 in. disking is about as efficient as plowing or as the combination. The application of nicotine sulfate in the regular spray practice, as indicated in the amount of fruit saved, more than pays the cost of the material and, since this material is mainly combined with the regular sprays, should prove a practical procedure. A study of the wintering quarters of the oriental peach moth conducted during the spring of 1926 indicates, where mummies occur in numbers under the trees, that 75 or 80 per cent of the oriental peach moth larvae overwinter on the ground. Around 15 per cent go over as larvae in cocoons on the parts of the tree from the crotch up and the balance on the trunk within a distance of 8 in. of the surface of the ground. All these results indicate (1) that peach trees should be treated with paradichlorobenzene as for peach borer and mounded high, (2) that some time in April the soil beneath the peach tree should be cultivated with plow or disk or both, and (3) that where the infestation is heavy the addition of nicotine sulfate to the regular spraying mixtures at the times recommended should be made. It has also been found that the overwintering larvae from the crotch of the tree upward are very shallowly placed and that, in all probability, a penetrating spray can be found which will destroy them; possibly a penetrating gas would do the work.

In control work with the European red mite a series of field tests were made on both peach and apple with the principal miscible oils and oil emulsions to compare their effect upon the eggs. The results obtained indicate that the oil emulsions and miscible oils have approximately the same value, although the oil emulsions run an actual oil content of about 2 per cent while the miscible oils run an actual oil content of about 4 per cent. An account of this pest by Hamilton has been noted (E. S. R., 55, p. 259).

Some tests of paradichlorobenzene dissolved in soluble pine-tar creosote for the control of the larvae of *Euzophera semifuneralis* Walk. in the bark of linden trees and of *Cryptorhynchus lapathi* L. in the pussywillow are reported by C. C. Hamilton (pp. 196–199). The material was prepared by dissolving paradichlorobenzene 1 lb. in 1 qt. of soluble pine-tar oil, the pine-tar oil being heated to approximately 120° F., at which temperature the paradichlorobenzene crystals dissolve quite readily. It was applied at a strength of 1 part to 2 parts of water against *E. semifuneralis* on September 11 with a compressed air sprayer. The tar oil penetrated to all places where the worms had bored in the bark or in the pithy growth and in some cases followed the burrows for several inches. The trees were not injured by the spray mixture, and no evidence was obtained of larvae boring in the trunks. Used against larvae of *C. lapathi* L. no injury to the tree was caused even when used undiluted, and it apparently was effective against the larvae.

A report of chemical studies of the New Jersey dry-mix spray in relation to arsenical injury by J. M. Ginsburg (pp. 199–206) is noted on page 743.

Brief reports of investigations of stickers in dusting mixtures and oil sprays and emulsifiers by Ginsburg (pp. 206, 207) are also presented. The results obtained in the latter investigations suggest that the superiority of oil emulsions over miscible oils may be ascribed to the fact that the former release their oil gradually, depositing an oily layer on the sprayed surface, whereas the latter form more homogeneous mixtures and possibly prevent intimate contact between the oil and the sprayed surface.

Brief reference is made by C. C. Hamilton to a study of the fundamental principles influencing the spreading, adherence, and distribution of arsenical

sprays, definite conclusions from which can not as yet be drawn. Studies of the distribution, quantity, and adherence of lead arsenate deposited in field spraying and their relation to twig and leaf growth are considered under the headings of development of twig and leaf growth at the different dates of spraying, quantity of lead arsenate upon foliage collected at different dates of spraying, and quantity of lead arsenate on the foliage developing between spray application. The results are reported in graph form.

Observations of the raspberry root borer (E. S. R., 55, p. 561) indicate that it is really a crown borer. It is annual brooded, pupation occurring from the middle of August to the middle of September, and emergence of the moths taking place between the end of August and the end of September. The eggs are first deposited on the under sides of leaves during the first week in September and oviposition ends by the close of the month. They hatch from about the middle of September to the middle of October. The newly hatched larvae crawl down the canes to a point just below the surface of the ground, where each proceeds to cut a shallow cell in the side wall of the cane in which to pass the winter. They emerge about the middle of April and bore channels in the lower part of the cane. The studies have shown that nicotine in the form of tobacco dust has a wider margin of safety than calcium cyanide and carbon disulfide, is far more efficient than nicotine in the form of Black Leaf 40, and should be applied with lime and sodium carbonate while the pest is in its winter quarters.

A report of the Cranberry Substation by C. S. Beckwith, B. F. Driggers, and C. D. Jones (pp. 215–228), noted on pages 714, 737, and 753, includes (pp. 222–224) an account of studies of the effect of winter submergence on the Japanese beetle larvae which indicate that the grubs are not able to go over the winter under bogs that are flowed for a period of four months during the winter and spring. Cultivated blueberry insects which received attention during the year are (1) a gall fly that damages the growing tips, (2) a stem borer resembling the raspberry stem borer, (3) a lepidopterous larva that bores in the berries, (4) several hymenopterous parasites associated with a gall on the stems, and (5) the cranberry root worm.

The studies of the previous year (E. S. R., 57, p. 59) having shown that either carbon disulfide or calcium cyanide applied to the soil with a temperature of 60 to 70°, at a time when the plants were not present, would destroy a very high percentage of wireworms, further tests were made in 1926. Calcium cyanide was applied with a special machine attached to the plow beam and the material distributed in the open furrow, which was promptly filled by the turning furrow slice. Applications were made on May 19, and an examination made to the depth of the subsoil on June 1 indicated a kill of 86 per cent. An excellent crop of spinach and cabbage was obtained on the treated plats with practically no plants missing.

Bee investigations reported by R. Hutson (pp. 229–237) include pollination studies, details of which are given in a bulletin previously noted (E. S. R., 5[illegible], p. 663). The use of ethyl acetate-carbon tetrachloride mixture for fumigation against wax moth was found effective at temperatures of about 60° F. (E. S. R., 56, p. 61). Gaseous chlorine appears to be effective as a disinfectant for American foulbrood infected comb. Breeding for resistance to European foulbrood and high production is reported upon.

Mosquito control work reported upon by T. J. Headlee and F. W. Mill[illegible] (pp. 237–254) is in part abstracted elsewhere (p. 779). Investigations [illegible] the disappearance of oil from polluted water led to the conclusion that hyd[illegible] carbon-digesting organisms are probably directly responsible for the break[illegible] up of the oil film, while bacteria attacking protein materials, releasing hydrog[illegible]

sulfide, seem to have effect through the production of this gas. Summarizing the results of work with mosquito repellents, it was found that thuja oil, cinnamic aldehyde, anisic aldehyde, bergamot oil, clove oil, and pyrethrum extract (ordinary insect powder extract) were most effective. When mixed with vaseline, cold cream, or face powders, they gave considerably longer protection than when applied alone. In making such a repellent it was found that about 4 to 6 parts of oil or extract mixed with 94 to 96 parts of vaseline or cold cream was most satisfactory. Studies of food for mosquito larvae showed that the chemical composition of the water determines the food supply, provided sufficient sunlight is present. In mosquito-migration studies approximately 20,000 adult mosquitos were collected and coated with a film of methylene blue. After the material had been given an opportunity to dry the trapped mosquitoes were freed and collections made continuously as long as the brood could be traced. Practical work of mosquito control is reported upon by counties and municipalities.

Economic insects in Silesia in 1925 [trans. title], K. SIMM (*Choroby i Szkodniki Roślin, 1 (1925), No. 4, pp. 36–42; Ger. abs., pp. 41, 42*).—This is an account of the insects of particular importance observed at the Silesian Experiment Station in 1925, considered under the headings of insects injurious to forests, insects attacking fruits, and enemies to field crops.

Entomological report, 1925–26, A. H. RITCHIE (*Tanganyika Ter. Dept. Agr. Rpt. 1925–26, pp. 33–36*).—Accounts are given of the occurrence of the more important insects of the year and particularly those affecting coffee and cotton.

Life history notes on the Rutherglen bug, J. H. SMITH (*Queensland Agr. Jour., 27 (1927), No. 4, pp. 285–302, figs. 8*).—This is a report of observations of the biology and importance of *Nysius* sp., known as the Rutherglen bug, a severe outbreak of which occurred in southern Queensland in 1926. Technical descriptions of its several stages are given in an appendix.

The rôle of Cimex lectularius in the epidemiology of relapsing fever [trans. title], H. P. ROSENHOLZ (*Centbl. Bakt. [etc.], 1. Abt., Orig., 102 (1927), No. 4–5, pp. 179–213, figs. 3; abs. in Rev. Appl. Ent., 15 (1927), Ser. B, No. 7, p. 121*).—This is a report of studies of the transmission of *Spirochaeta obermeieri*, together with a review of the literature. Attempts to transmit the disease by the bites of infected bugs were unsuccessful.

Control work with an aphid attacking tobacco [trans. title], J. C. VAN DER M. MOHR (*Meded. Deli Proefsta. Medan, 2 ser., No. 44 (1927), pp. 34, pls. 7; Eng. abs., pp. 33, 34*).—This is a report of control work conducted at the Deli Experiment Station at Medan, Sumatra, during the latter half of 1926, in which several types of sprays were tested to determine their efficiency.

The woolly apple aphis (Eriosoma lanigera Hausm.) in Japan, with special reference to the life-history and the susceptibility of the host-plant, K. MONZEN (In *Verhandlungen des III. Internationalen Entomologen-Kongresses, Zürich, 1925, Weimar: G. Uschmann, 1926, vol. 2, pp. 249–275, figs. 2; abs. in Rev. Appl. Ent., 14 (1926), Ser. A, No. 12, pp. 585, 586*).—The author here reviews the status of knowledge of the woolly apple aphid at length in connection with a list of 80 references to literature, and then records personal studies made at Morioka, Japan, latitude 43° N. Little has been known of this aphid in Japan, where it is the most serious apple pest.

Schizoneura lanigera Hausm. in southern Poland [trans. title], A. KRASUCKI (*Choroby i Szkodniki Roślin, 1 (1925), No. 4, pp. 22–30; Ger. abs., pp. 29, 30*).—This is an account of observations of the woolly aphid in southern Poland where it first appeared in 1901, and since which time it has become an important pest.

The peach cottony scale, S. W. Harman (*New York State Sta. Bul. 542* (*1927*), *pp. 19, pls. 3, figs. 5*).—This account of the peach cottony scale (*Pulvinaria amygdali* Ckll.?), studies of which by Parrott and Harman have been noted (E. S. R., 57, p. 453), deals briefly with the life history and habits of the species and reports in detail on control work conducted with spray mixtures and the methods employed. Much of the data relating to control work are presented in tabular form. In tests made of lubricating oil emulsions containing 2, 4, and 6 per cent oil, the killing efficiency, in the main, was in proportion to the oil content. While in certain instances applications of mixtures containing 2 per cent of oil displayed a high degree of efficiency, it appears that preparations of this strength are not wholly dependable. Considering efficiency as well as economy, the author is of the opinion that a mixture containing 4 per cent of oil best meets practical needs.

With miscible oils the killing efficiency varied with different brands as well as with different dilutions of the same brand. In the main, a dilution of the maxmum strength recommended by the manufacturers for the treatment of peach orchards afforded efficient protection with no evidence of injury to the trees.

In employing the different types of oil sprays, whether lubricating oil emulsions or miscible oils, it is recommended that application be made in the spring as the buds are swelling; that quiet, warm, balmy days be selected as far as possible for the spray operation; and that the materials be applied as a fine mist in an endeavor to wet all surfaces of the bark. In treating the trees, growers are cautioned not to overlook pruning scars and cankered areas since they often harbor large numbers of the scales.

The swarming caterpillar as an instance of the difficulties of insect control, Y. Ramachandra Rao (*Jour. Madras Agr. Students' Union, 14* (*1926*), *No. 8–12, pp. 198–203*).—This is a discussion of the army worm of paddy, *Spodoptera mauritia*.

Cutworms in the garden, W. H. White (*U. S. Dept. Agr. Leaflet 2* (*1927*), *pp. 2, fig. 1*).—A brief practical account.

The azalea leaf miner (Gracilaria azaleella Brants) [trans. title], A. Tullgren (*Centralanst. Jordbruksförsök* [*Sweden*] *Flygbl. 118* (*1927*), *pp. 7, figs. 6*).—A brief account of this enemy of azalea with notes on its occurrence, biology, and control.

A contribution to our knowledge of the North American Conopidae (Diptera), M. C. Van Duzee (*Calif. Acad. Sci. Proc., 4. ser., 16* (*1927*), *No. 18, pp. 573–604*).—The author gives descriptions of 22 new species and 1 new subspecies, presents tables for the separation of the species of 7 genera, and gives a list of the North American species of the family.

Buffalo gnat (Eusimulium pecuarum Riley) a lethal insect (*North Amer. Vet., 8* (*1927*), *No. 6, pp. 47, 48, 57*).—In this account J. F. Barnett, of Yazoo City, Miss., calls attention to the importance of this simulid.

Plague investigation in South Africa from an entomological aspect, A. Ingram (*So. African Inst. Med. Research Pubs., No. 20* (*1927*), *pp. 222–255, figs. 2*).—The author reports upon three of the fleas commonly found on wild rodents, namely, *Dinopsyllus lypusus*, *Chiastopsylla rossi*, and *Xenopsylla eridos*, which are apparently able to transmit plague from infected rodents to uninfected rodents. The house rat flea, *X. brasiliensis*, can act in a similar capacity.

Four of the fleas infesting the wild rodents, namely, *D. lypusus* J. and R., *X. eridos* Rothsc., *X. erilli* Rothsc., and *C. rossi* Watrst., are capable of sucking human blood. *X. brasiliensis* Baker, an ectoparasite of the house rat, is also capable of feeding on human blood.

The average period of survival of adult fleas apart from their hosts, in glass tubes, was 27 days; when the fleas were placed in an old nest of a gerbille this period was extended to 60 days.

A list is given of the ectoparasites found in the nests or on the bodies of rodents and small Carnivora supposed to be implicated in the spreading of plague in the Union.

Manuring in relation to the control of shot-hole borer of tea, F. P. Jepson and C. H. Gadd (*Ceylon Dept. Agr. Bul. 78 (1926), pp. 49, pls. 5*).—In work conducted with *Xyleborus fornicatus* with a view to ascertaining the relative values of nitrogen, potash, phosphoric acid, and lime in the control of the pest in tea, none of the treatments had any direct effect on the beetle, the main benefit resulting from the accelerated healing of the galleries.

A preliminary note on "Chalcid No. 1594," a parasite of Ptychomyia remota, Ald., B. A. R. Gater (*Malayan Agr. Jour., 14 (1926), No. 10, pp. 340–348, pls. 2*).—A report of studies of the biology of an important parasite of the pupa of the tachinid *P. remota*, which tachinid is the most important parasite of *Artona catoxantha* in the Malay Peninsula.

Mites as pests of the tea plant, S. S. Light (*Trop. Agr. [Ceylon], 68 (1927), No. 4, pp. 229–238*).—This is a discussion of the mites attacking tea plants in Ceylon and other countries, their differentiation, damage caused, and remedial measures.

ANIMAL PRODUCTION

The American Society of Animal Production: Record of the proceedings of annual meetings, November, 1925–26 (*Amer. Soc. Anim. Prod. Proc. 1925–1926, pp. 316, figs. 11*).—This is a combined report of the annual meetings held at Chicago in November, 1925, and November, 1926.

The following papers were presented in 1925: What Does Our Society Mean to Us? by G. Bohstedt (pp. 9–12); Value of Livestock Feeding Experiments by E. S. Good (pp. 12–14); Methods for Feeding Experiments, by E. A. Trowbridge (pp. 14–16); Equipment for Feeding Experiments, by H. P. Rusk (pp. 17, 18); Publishing Results of Feeding Experiments, by C. W. McCampbell (pp. 18–20); Interpreting Experimental Results, by H. J. Gramlich (pp. 21, 22); Advances in Respiration Calorimetry with Cattle, by E. B. Forbes (pp. 23–32); The Energy Basis of Measuring Milk Yields, by W. L. Gaines (pp. 33–36); Systems of Measuring the Nutritive Energy of Farm Feeds, by E. B. Meigs and F. M. Grant (pp. 36–39); Genetic Foundations in Crossbreeding, by L. J. Cole (pp. 39–42); Practical Considerations in Crossbreeding, by E. N. Wentworth (pp. 42–49); Inheritance of Resistance to Disease, by E. Roberts (pp. 50–53); A Superior Litter of Crossbred Pigs, by C. C. Culbertson and J. M. Evvard (pp. 53–59); Prolificacy of Sows and Mortality of Pigs, by A. Severson (pp. 60–62); A Chemical Test for Sex, by D. G. Steele and A. L. Zeimet (pp. 63, 64); Iron Deficient Swine Rations, by G. Bohstedt, R. M. Bethke, and B. H. Edgington (pp. 64–67); The Influence of Fish Meal on Calcium Assimilation, by L. A. Maynard and R. C. Miller (pp. 68–71); Cooperative Soft Pork Investigations, by O. G. Hankins (pp. 72–75); Soft Pork—Corn Belt, by C. M. Vestal (pp. 75–77); Soft Pork—South, by G. S. Templeton (pp. 77, 78); Feeding Rye to Pigs, by E. F. Ferrin (pp. 79–83); Preparation of Kafir Corn for Fattening Hogs, by C. P. Thompson (pp. 83, 84); Swine Breeding: The Effect of Age, Unfavorable Dietary Conditions, and the Normal Oestrous Cycle, by F. G. Mumford, A. G. Hogan, and F. F. McKenzie (pp. 85–88); Wool Investigation Progress and Needs, by J. A. Hill (pp. 88–93); Prevention and Elimination of Gastrointestinal Parasites of Lambs, by D. S. Bell (pp. 94–97); Factors Which

Influence Fleece Weights of Rambouillet Sheep, by D. A. Spencer (pp. 97–101); Influence of Sex on Rate of Gain by Lambs, by F. G. King (pp. 102, 103); Methods of Instruction in the Wool Laboratory, by R. H. Burns (pp. 103–108); Water Consumption by Sheep, by C. S. Plumb (pp. 109–112); Value of Weed Seeds for Fattening Lambs, by D. J. Griswold (pp. 112–114); Methods of Selecting Wool Samples in Shrinkage Studies, by J. M. Jones and J. L. Lush (pp. 115–117); Correlations on the Composition of Beef, by C. Chatfield (pp. 117–119); Correlation of Grades of Animals with Grades of Carcasses by the Score Card Method, by A. T. Edinger (pp. 119–121); Beef Quality and Slaughter Tests, by W. J. Loeffel (pp. 122–124); Correlation of Body Measurements of Beeves to Dressing Percentage, by E. J. Wilford (pp. 124–126); Distribution of Protein in the Muscle of the Fowl, by P. E. Howe (pp. 126, 127); A New Set of Index Numbers Measuring Slaughter and Cost Trends in the Livestock Industry, by T. U. H. Ellinger (pp. 127–132); Horse Feeding Tests, by J. A. Simms (pp. 133, 134) (E. S. R., 54, p. 469); Problems in Feeding Velvet Beans, by W. D. Salmon (pp. 135–137); Present Status and Results of the Cottonseed Meal Feeding Investigations, by R. S. Curtis (pp. 138–140); The Effect of a Restricted Diet, by J. R. Slonaker (pp. 141, 142); Cooperation in the Livestock and Meat Industry, by R. C. Pollock (pp. 143–145); Pastures of the Coastal Plain, by S. W. Greene (pp. 145–147); Some Principles of Extension Teaching, by A. B. Graham (pp. 147–151); Iowa Feeder Cattle Demonstrations, by R. Beresford (pp. 151–154); A Successful Swine Sanitation Project, by M. B. Posson (pp. 154–156); Wool Improvement on the Farm, by V. A. Freeman (pp 156–158); Wool Improvement on the Range, by H. A. Lindgren (pp. 159, 160); Dean Curtiss and the Student Body, by C. L. Burlingham (pp. 161–163); Professor Curtiss and His Associates, by J. Clay (pp. 163, 164); and The Life Work of Brayton H. Ransom, by B. H. Raffensperger (pp. 164–166).

The following papers were presented in 1926: Specialization in Research Demands Cooperation, by H. P. Rusk (pp. 186–190); A Study of the Variability of the Computed and the Directly Determined Fasting Katabolism as a Measure of the Maintenance Requirement of Energy, by E. B. Forbes (pp. 191–194) (E. S. R., 57, p. 66); Mineral Supplements for Dairy Cows, by J. B Lindsey and J. G. Archibald (pp. 194–197); Nutritive Value of Alfalfa Hay Cut at Different Stages of Maturity, by J. Sotola (pp. 197–200); Further Data on Inheritance of Resistance to Disease, by E. Roberts and L. E. Card (pp. 201–203); The Value of Herdbook Data for the Genetic Investigation of Sex Ratio and Frequency of Sex Combinations in Swine, by H. C. McPhee (pp. 203–206); How Much Accuracy is Gained by Weighing Cattle Three Days Instead of One at the Beginning and End of Feeding Experiments, by J. L. Lush and W. H. Black (pp. 206–210); Wintering Steers with and without Corn Silage Preparatory to Finishing on Grass without Grain, by E. S. Good (pp. 211–213); The Effect of Spaying in Beef Production, by H. J. Gramlich (pp. 213–216); Preliminary Report of Steer Feeding Trials, by W. L. Blizzard (pp. 216–218); Corn and Cob Meal for Fattening Baby Beef Calves, by H. W. Vaughan (pp. 218–221); "Dinner Table" vs. "Dinner Pail" for Baby Beeves, by G. Bohstedt (pp. 222) (E. S. R., 56, p. 262); The Radiant Energy Factor and Its Effect upon the Growth of Pigs, by F. C. Olson and W. J. Loeffel (pp. 222–225); Calcification Studies with Menhaden Fish Meal, by L. A. Maynard and R. C. Miller (pp. 226, 227); The Value of Different Carriers of Phosphorus in Mineral Mixtures for Swine, by W. L. Robison (pp. 227–231); The Danish System of Swine Improvement, by E. F. Ferrin (pp. 231–235); Influence of Adding Oats to a White Corn Ration in Growing and Fattening Pigs, by E. A. Livesay and E. C. Stillwell (pp. 235–239); Problems of

Shrinks and Fills in Marketing Hogs, by E. N. Wentworth (pp. 240–242); Wool Studies with Rambouillet Sheep, by F. S. Hultz (pp. 243–246); Preliminary Report on Pregnancy Disease of Ewes, by L. J. Horlacher (pp. 246–248); Trends in the Export of Livestock Products, by D. M. Strail (pp. 248–255); Measuring the Color of Beef, by P. E. Howe (pp. 256, 257); Determination of the Amount of Connective Tissue in Meat, by H. H. Mitchell, R. L. Zimmerman, and T. S. Hamilton (p. 257); Correlating Cooking Research with Factors which Influence the Quality and Palatability of Meat, by L. M. Alexander (pp. 258–260); A Demonstration of the Quality and Palatability of Beef, by P. E. Howe (pp. 260, 261); How to Teach, by C. V. Williams (pp. 261–265); Methods in Feeding Experiments, by G. Haines (pp. 266–268); A Visit to the Agricultural College of Denmark, by T. U. H. Ellinger (pp. 268, 269); Length of Stabling Season, by M. A. R. Kelley (pp. 270–273); The Livestock Man's Concern with the Corn Borer Infestation, by C. W. Gay (pp. 273–276); Report of Activities of the Division of Biology and Agriculture of the National Research Council (pp. 276–279); "Truth in Meats" Exhibits, by H. A. Lindgren (pp. 280–282); The Missouri Beef Herd Demonstration, by J. W. Burch (pp. 282–285); The Consumer, the Market, and the Producer, by J. E. Poole (p. 285); Minnesota Carload Baby Beef Contest, by A. A. Dowell (p. 285); Dr. Mohler and the Meat Industry, by R. F. Eagle (pp. 286–288); The Contribution of Dr. Mohler to Research, by A. Eichhorn (pp. 289–291); and Response: The Interrelation between Disease Control and Animal Husbandry Problems, by J. R. Mohler (pp. 292–294).

Effect of phosphorus deficient rations on blood composition in cattle, L. S. PALMER and C. H. ECKLES (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 4, pp. 307–309*).—Continuing this study at the Minnesota Experiment Station (E. S. R., 56, p. 366), determinations were made of the phosphorus and calcium content of the blood of some of the experimental cattle. The analyses showed an abnormally low phosphorus content in the blood plasma of animals on the hay and oat ration either with or without $CaCO_3$ supplement. The $Ca \times P$ content for these animals was rarely above 30 and frequently below 20. In contrast is the normal composition of blood of animals on the same ration plus NaH_2PO_4, which ranged from 50 to 75.

[Steer feeding investigations at the Caldwell, Idaho, Substation] (*Idaho Sta. Bul. 149 (1927), p. 21*).—The results of experiments with 2-year-old steers (E. S. R., 55, p. 862) indicated that corn was more efficient than barley, 100 lbs. of gain being produced on 431 lbs. less alfalfa hay and 88 lbs. less grain. Also 2,592 lbs. of corn silage replaced 606 lbs. of alfalfa hay and 346 lbs. of barley in producing 100 lbs. of gain. However, the gains were less, the cost higher, and the selling price and dressing percentage lower for the silage fed lot.

The production requirement of fattening sheep, T. B. WOOD (*Jour. Min. Agr. [Gt. Brit.], 34 (1927), No. 4, pp. 295–307, figs. 2*).—In this work the records of feeding trials, especially designed feeding trials, and comparative slaughter tests were used as the basis for the data reported. Summarizing all the figures, the author concludes that on the average it requires 2.5 lbs. of starch equivalent per pound of live-weight increase for fattening sheep. With young animals in the early stages of fattening the requirement is 2 lbs. of starch equivalent for this increase, and in the later stages of fattening 3 lbs. of starch equivalent. This requirement for fattening is added to the maintenance requirement.

Temporary pastures for fattening spring lambs, L. J. HORLACHER (*Kentucky Sta. Circ. 38 (1927), pp. 35–49, figs. 4*).—This circular summarizes the work on the use of temporary pastures previously noted (E. S. R., 54, p. 362;

56, p. 163). Rape and rape and oats proved to be slightly superior from the standpoint of gain to bluegrass. Temporary pastures are highly successful under an intensive system of sheep production, where bluegrass cannot be produced, or as a supplement to bluegrass. Where bluegrass is available it is doubtful whether the increased cost of such temporary pastures would pay for the slight increase in gain.

Lamb-raising trials, season 1926, J. M. Coleman (*Agr. Gaz. N. S. Wales, 38 (1927), No. 3, pp. 365, 366*).—Dorset Horn and Ryeland rams were crossed with Border Leicester×Merino ewes at the Bathurst Experimental Farm, New South Wales, 100 ewes being used in each case. From the Dorset Horn cross 119 lambs were born, and 113 from the Ryeland cross. At one month of age the Dorset Horn lambs averaged 28.85 lbs. in weight and the Ryeland lambs 27.2 lbs. The average increases in weight in an 84-day period were 52.25 and 47.75 lbs., respectively. The Ryeland cross lambs sold at a higher price because they produced a carcass more suitable for export trade, and, being low-set, gave an appearance of being heavier than the Dorset Horn cross lambs.

[Swine feeding investigations at the New Jersey Stations], F. G. Helyar (*New Jersey Stas. Rpt. 1926, pp. 86–101, figs. 4*).—Several experiments are reported, some of which are continuations of work noted (E. S. R., 57, p. 69).

A study of farrowing records.—During the past three years a study has been made of the farrowing records of brood sows and the factors that influence the number of pigs weaned and raised. In 1924 the percentage of pigs weaned was 49.6, in 1925 56.6, and in 1926 61.4. This reduction in mortality has followed the use of a definite method of decreasing roundworm infestation.

A study of the effect of Protozyme on the utilization of food by swine.—This study by W. C. Skelley was divided into three parts to determine the effect of Protozyme on (1) suckling pigs, (2) weanling pigs, and (3) shotes. With the suckling pigs (4 weeks old) the check lot received a ration of corn meal, red dog middlings, tankage, and skim milk powder. In the other lots, 1, 2, 3, 4, and 5 per cent of Protozyme was added to this ration. The pigs were not removed from their dams, but allowed to nurse until 8 weeks old. After weaning, the pigs were continued 28 days longer in the same groups and on the same rations. There were indications that the addition of Protozyme increased the rate and economy of gain both before and after weaning, but the results were too conflicting to draw any conclusions.

Two lots of pigs, averaging about 72 lbs., were self-fed corn, wheat middlings, and tankage as a basal ration, to which was added in one lot 3 per cent of Protozyme. Protozyme increased slightly the rate of gain, but at an increased cost over the basal ration which probably does not justify its use.

A comparison of the effect of fishmeal and tankage on the rate of growth and on the texture and quality of the carcass of swine.—In continuing this work, carried on by Skelley et al., representative hogs were selected from the two groups and slaughtered. Chemical analyses were made of the shoulder, side, and ham for moisture and nitrogen content. No essential differences were noted between the muscle tissues of the two hogs.

Hogging down corn.—One-half of a 3.12-acre field planted to Reid Yellow Dent corn was cut, shocked, weighed, and fed to a lot of 16 177-lb. pigs in dry lot. The remainder of the field was "hogged down" by a similar lot of pigs. Both lots were self-fed tankage in addition. The harvested corn averaged 60.6 bu. of shelled corn per acre. The corn in both lots was fed out in 26 days, and in addition the dry lot pigs ate 150 lbs. of tankage and the pigs in the field 140 lbs. of tankage. The dry lot pigs made an average daily gain per head of 2.26 lbs. and those in the field 1.81 lbs. After subtracting the cost of harvesting

and feeding, the pigs in dry lot made a net return of $76.40 while those in the field returned $105.70. *Hogging down corn in this test saved 52 man hours and 8.3 team hours.*

Influence of field peas on skeleton [of hogs] (*Idaho Sta. Bul. 149 (1927) pp. 21, 22*).—Continuing the work with field peas (E. S. R., 54, p. 760) 4 lots of 8 shotes were fed as follows: Lot 1 cracked peas, lot 2 cracked peas and minerals, lot 3 cracked peas 1 part and rolled barley 2.5 parts, and lot 4 the same as lot 3, with the addition of minerals. The mineral mixture consisted of steamed bone meal 30 parts, ground limestone 30 parts, and common salt 30 parts. The feed required per 100 lbs. of gain in the respective lots was 445, 402, 478, and 430 lbs. The actual bending load required to break the right femur in the respective lots was 555, 634, 569, and 643 lbs.

Fall pigs fed from February 13 to March 26 on 6 parts ground wheat and 1 part cracked peas made an average daily gain of 1.83 lbs. per head and required 442 lbs. of feed per 100 lbs. of gain. Two lots of 8 fall pigs each were fed the following rations: Lot 1, 3 parts cracked peas and 7 parts ground barley, lot 2 the same, with the addition of cut alfalfa hay. The average daily gains per head were 1.08 and 1.2 lbs., respectively. Lot 1 required 472 lbs. of feed per 100 lbs. of gain and lot 2 required 437.5 lbs. of grain and 25.6 lbs. of hay for the same gain.

[Experiments with poultry at the Idaho Station] (*Idaho Sta. Bul. 149 (1927), pp. 35–37*).—Statistical studies show that pullets which mature early lay more eggs to March 1 and throughout the year than those that mature slowly. The early maturing pullets weigh less when they start to lay and lay smaller eggs than the slower maturing pullets. The greater the maximum weight of the bird for the year, the heavier is the mean egg weight, but body weight is not correlated with the number of eggs produced. No correlation exists between size of eggs and egg record. Hens that lay best in their pullet year also lay best in their second year.

A very definite relationship was found to exist between the weight of eggs set and the weight of chicks hatched. Chicks from the larger eggs were heavier, and this relationship still existed at 8 weeks of age.

[Poultry investigations at the New Jersey Stations], F. H. CLICKNER (*New Jersey Stas. Rpt. 1926, pp. 380–389*).—The results of several experiments are noted.

A study of the value of Protozyme, a fungus enzyme, in the feeding of poultry.—Pullets reared from chicks fed as previously noted (E. S. R., 55, p. 868) were housed in 10 pens of 50 birds each. Half of the pens were continued on the same quantity of Protozyme on which they had been raised. In the other lots the Protozyme was discontinued, except in the check lot to which 2 per cent was added. The rest of the ration was the regular New Jersey ration. All lots continued healthy throughout an 11-month laying period, except one lot to which bronchitis gave a severe setback. In all but one case where the Protozyme was continued the egg production was considerably higher than when the Protozyme was omitted from the laying ration. Three per cent Protozyme gave the highest egg production, followed by 5 per cent, 1 per cent, 2 per cent, and none, respectively.

The effect of using electric lights on laying birds.—Two pens of Single Comb White Leghorns of 100 birds each were housed on September 15. In one lot lights were turned on early in the morning, from November 1 to April 1, and allowed to burn until daylight. In the other pen no lights were used. There was a slight neck molt in both pens, but a greater number of birds went into complete molt in the unlighted pen. The hens in the pen receiving light laid

6,992 eggs from November until April, and those in the unlighted pen laid 5,595 eggs.

A comparison of two dry mash mixtures for laying hens.—Two pens of Single Comb White Leghorns of 50 birds each were fed mashes having a nutritive ratio of 1:3.5 and 1:3.9. The scratch grain for both lots consisted of equal parts of cracked corn and whole wheat. The first lot laid 3,516 eggs in 8 months and the second lot, 3,695 in a like period.

A comparison of three sources of animal protein.—The value of animal proteins from different sources was tested in 3 pens of Barred Plymouth Rocks of 33 pullets each. The grain and mash feeds were the same in each pen, except that lot 1 received Meato (75 per cent protein), lot 2 meat scrap (50 per cent protein), and lot 3 bone meal (25 per cent protein). These feeds were fed in such amounts that all lots received practically the same quantity of protein. Pen 3 did not consume enough dry mash to keep the body in condition. During the period from December to April, pen 1 laid 1,607 eggs, pen 2 1,516 eggs, and pen 3 1,045 eggs.

Poultry management at the New Jersey egg laying contests, W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 11, pp. 4, fig. 1*).—The methods of feeding, housing, and management of the flocks at the Vineland and the Bergen County egg-laying contests are described.

Farm poultry (*Ontario Dept. Agr. Bul. 329 (1927), pp. 80, figs. 67*).—This bulletin covers in a clear, concise manner the practical aspects of the production of farm poultry. Charts and illustrations serve to emphasize the text.

The "how to do it" poultry book, E. T. Brown (*London: C. Arthur Pearson, 1927, pp. 256, pls. 33, figs. 52*).—A practical guidebook designed for both the small and large producer. All the aspects of the poultry industry are clearly described. Special attention is given, in the text and by drawings, to the construction of equipment necessary to the poultry plant.

Back-yard production.—Profitable poultry raising, L. Brechemin (*La Basse-Cour Productive.—Les Poules Élevage Lucratif. Paris: Libr. Agr. Maison Rustique, [1926], new ed., pp. 364, figs. 80*).—A guidebook for the small producer of poultry, covering such subjects as choosing a breed; housing; feeding; management; hatching, both natural and artificial; intensive egg production; and the diseases of poultry.

Raising domestic rabbits, D. M. Green (*U. S. Dept. Agr. Leaflet 4 (1927), pp. II+6, fig. 1*).—This article presents in a popular manner the accepted practices of breeding, feeding, housing, and management of rabbits. Appended are several recipes for cooking rabbit.

DAIRY FARMING—DAIRYING

The dairy cow, P. Dechambre (*La Vache Laitière. Paris: Libr. Agr. Maison Rustique, 1926, 3. ed., rev. and enl., pp. XIII+338, figs. 25*).—This is a third, revised and enlarged edition of this book (E. S. R., 19, p. 271).

[Experiments with dairy cattle at the Idaho Station] (*Idaho Sta. Bul. 149 (1927), p. 26*).—Groups of calves were raised on skim milk; on buttermilk curd, a new type of semisolid buttermilk; and on Hi-Lactic milk, a newly patented condensed sour skim milk. All three products proved successful for rearing calves.

In experiments on wintering heifers, one group was fed alfalfa hay and 2 lbs. of barley per day, another group received alfalfa hay and pea straw plus barley, and a third group was fed pea straw and barley. Growth and development of the heifers ranked in the order named above. Pea straw may be substituted for alfalfa hay, but has a lower feeding value.

[Experiments with dairy cattle at the New Jersey Stations], J. W. BARTLETT (*New Jersey Stas. Rpt. 1926, pp. 135, 136, 141–143*).—The results of two experiments are noted.

Rations for dairy heifers during winter months.—Three groups of heifers were used in this test (E. S. R., 57, p. 73). Group 1 received an average of 6 lbs. of grain, with alfalfa hay and silage ad libitum in a dry stock barn. Group 2 ran outside with an open shed for shelter and received an average of 10 lbs. of grain per day with the hay and silage ad libitum. Group 3 received the hay and silage ad libitum in a dry stock barn. All animals were weighed and measured each month. From the cost and condition standpoint the results favored the management followed in group 1.

Effects of ultra-violet irradiation and green feed on the mineral constituents of the blood and milk of cows on adequate diet but protected from direct sunlight.—Five cows were used in this test. All were protected from sunlight, and four were irradiated for periods of from one-half to one hour daily for one month with a quartz mercury vapor lamp. The other cow was used as a check. After one month's treatment the cows were held for two weeks without treatment and the following two weeks were fed liberal amounts of green alfalfa daily. Irradiation for one-half hour per day did not noticeably affect the amount of milk nor the percentage of calcium or phosphorus in the milk or blood. There were some evidences of increased calcium in the milk when the cows were irradiated for one hour per day, but the other constituents in the milk and blood were not affected. Green alfalfa showed no evidence of affecting the quantity of milk nor the quality of milk or blood.

Udder size in relation to milk secretion, J. W. GOWEN and E. R. TOBEY (*Jour. Gen. Physiol., 10 (1927), No. 6, pp. 949–960, fig. 1*).—Nine cows were milked twice a day for 5 days, and the milk was weighed and sampled at each milking. The animals were then killed at milking time, the udders dissected, and the amount of milk present determined. In most cases this determination was made by cutting the udder and allowing as much milk to drain as possible. The remaining material was ground and extracted with water for three extractions. Little success followed an attempt to press the milk from the udder tissue by means of hydraulic pressure.

The results indicate that most of the milk is present as such in the udder of the cow at milking time. There is no evidence that over 20 per cent of the milk obtained is secreted during milking. About 0.2 lb. of secreting tissue was necessary for secreting 1 lb. of milk in a 15-hour period. The size of the udder is deemed a close measure of the amount of milk the cow is able to secrete.

Thermo-tolerant organisms as a cause of so-called pin-point colonies, A. C. FAY (*Jour. Bact., 13 (1927), No. 5, pp. 347–377*).—In this paper from the Kansas Experiment Station an effort has been made to outline the pin-point colony problem. The organisms studied here are not the sole cause of pin-point colonies.

The organisms develop on low (1:100) dilution plates when plain agar is used, and hence are hard to detect in thickly seeded plates of raw milk or cream. After pasteurization they may be easily counted. There are two types of colonies, those visible with a hand lens (type A) and those large enough to be detected with the naked eye (type B). Attempts to culture the organisms at 63° C. (145.4° F.) failed, and it was concluded that the colonies encountered in this work were thermotolerant but not thermophilic. The resistance of these organisms to pasteurization is shown by the fact that on the average 99.84 per cent survived the first pasteurization, 72 per cent the second, and 46 per cent the third.

A study of the effect of various media on the growth of these organisms showed that a very small amount of carbohydrate greatly increased the chances of the colonies appearing on the plates. Thirty-seven per cent of the isolated colonies grew normally on plain agar, but the addition of 0.01 cc. of sterile milk enabled 64 per cent of the cultures to grow. Casein and whey agar were somewhat unfavorable for growth, but more favorable than plain agar. There was no consistent preference for Difco or Witte's peptone. Acid media discouraged the growth of colonies. The most resistant cultures isolated were killed by heating in a steamer for one minute, or by treating for an equal time with a commercial hypochlorite solution.

Biochemical studies showed that type A was characterized by fermentation of sucrose, failure to ferment arabinose or salicin, and a methyl-red negative reaction. Type B was characterized by ability to ferment arabinose or salicin, inability to ferment sucrose, and a methyl-red positive reaction. Most of the cultures were classified into three morphological groups, (1) very short oval rods or elongated cocci, (2) short chains, 4 to 10 cells in length, and (3) short rod-shaped cells in pairs, one cell being much shorter than its mate.

The author concludes that since the organisms are resistant to pasteurization the solution of the problem must be through preventive measures and their presence not ignored as has been suggested by some.

The effect of pasteurization temperature on individual germs found in milk, J. M. Brannon and M. J. Prucha (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 263–268*).—This is a preliminary report from the Illinois Experiment Station on the effect of pasteurization on 70 different types of bacteria found in milk. The organisms were incubated in sterile milk at 37° C. (98.6° F.) for from 2 to 5 hours. Plates were made before and after pasteurization. Pasteurization lasted for 35 minutes at 62.5°. No effort was made to determine the names of the organisms.

Of the 70 bacteria, 47 were nonspore-forming organisms. Only 2 of these survived pasteurization. In no case was a spore-forming organism entirely eliminated by pasteurization, and in two instances larger counts were obtained after pasteurization. This increase was probably due to the breaking up of clumps of spores, since neither organism grew at temperatures of 50°. Twenty-six known organisms were similarly treated. In this case all but one nonspore-forming organism and all the colon organisms were killed by pasteurization.

No conclusions were drawn from this work.

A study of methods for bacterial analyses of market milk, L. H. Cooledge (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 269–281, fig. 1*).—In continuing this study of bacterial analyses (E. S. R., 54, p. 673), it was found that no one medium should be expected to give results which indicate correctly the condition of all grades of milk. The pH score proved more efficient than did the plating methods. The higher the number of bacteria present the more efficient were the methods in detecting changes. The medium giving the highest counts depends upon the predominant groups of bacteria present. In 81 comparisons of the pH score with the reductase ratings and the bacterial plate counts, the pH score checked as well with the number of bacteria per cubic centimenter as did the reductase rating.

Improved sanitation in milk production, R. J. Posson (*U. S. Dept. Agr. Leaflet 3 (1927), pp. 8, figs. 9*).—Methods for producing clean milk are pointed out, such as clean, healthy cows and milkers, small top pails, and sterilization of utensils. Cooling milk is also noted as a means of reducing bacterial contamination.

The butter industry, O. F. HUNZIKER (*LaGrange, Ill.: Author, 1927, 2. ed., rewritten, pp. [15]+682, figs. 143*).—A second and revised edition of this book previously noted (E. S. R., 43, p. 779).

A volume weight study of ice cream, A. W. PHILLIPS (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 232–249*).—A study was made at the Massachusetts Experiment Station to determine the effect of size and type of dishing tool, overrun, personal equation, size and shape of carton, dishing temperature, and varying composition on the shrinkage of ice cream when dished from bulk containers. A standard mix was used for most of the work. The handling of all mixes was uniform, and all processes were as standard as possible. The dipping was done from 3-gal. cans. The regular self-ejecting semispherical disher was used in most of the work. In addition, an ice cream spoon, trowel, and the round and square "loader" were used. Round and tapering pint cartons were the shapes used in the study.

The shrinkage of ice cream dished from bulk containers averaged about one-third the original volume. The shrinkage was about the same regardless of the type of disher used, but the ice cream spoon was found to be the most practical. The "loaders" were not very satisfactory and unless care was taken in their use could be quite unsanitary. Overrun had little effect upon volume shrinkage. The personal equation is of vital significance in commercial practice. A careful operator can keep shrinkage at a minimum. Only extremes of dishing temperature had a marked effect upon shrinkage, and the composition of the mix had less influence upon shrinkage than the personal equation.

Separation of cane sugar from water ice, A. LEIGHTON (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 219–223, figs. 2*).—In an effort to develop a means of preventing the cane sugar in water ices from crystallizing, studies were undertaken by the Bureau of Dairy Industry, U. S. D. A. About 20 lbs. of a cane sugar solution containing 25 per cent sugar, to which 0.5 per cent gelatin was added to give body, was frozen and placed in the hardening room. It was cooled to less than −14° C. (6.8° F.), then warmed gradually, temperatures being taken at the center of the mass at intervals varying from 5 minutes to 0.5 hour. There was a distinct change in the slope of the warming curve at about −12°.

The author concludes that if water ice is not cooled to a temperature equal to or below −12° cane sugar can not separate from the solution. This temperature is not dependent upon the original sugar concentration, and is but little altered by the flavoring material. Below this temperature crystallization will probably be greater with higher sugar concentrations.

VETERINARY MEDICINE

The bacteriophage and its behavior, F. d'HERELLE, trans. by G. H. SMITH (*Baltimore: Williams & Wilkins Co., 1926, pp. XIV+629, figs. 31*).—This is a translation of the second French edition, previously noted (E. S. R., 57, p. 181).

A critical review of the present position of bacterial agglutination, W. J. TULLOCH (*Jour. Roy. Army Med. Corps, 48 (1927), Nos. 2, pp. 96–116; 3, pp. 192–203; 4, pp. 267–285, figs. 4; 5, pp. 358–368, fig. 1; 6, pp. 435–447, figs. 3*).—This review deals with the subject under the headings of flagellar and somatic agglutinins, floccular and granular agglutination, thermostability and thermolability of antigens, agglutination of "rough" and "smooth" types of colonies and relationship thereof to thermostability of antigens, diphasic variation, relationship of chemical to serological analysis, and physicochemical considerations.

[Report of work in bacteriology at the Idaho Station] (*Idaho Sta. Bul. 149 (1927), pp. 23, 24*).—In the course of investigations of surface tension and

bacterial development, seven organisms were studied in order to observe their behavior when grown in media of varying surface tension. These organisms included *Escherichia coli*, *Diplococcus pneumoniae*, *Streptococcus viridans*, *S. hemolyticus*, and other strains of staphylococci. It was found that in general there was a marked inhibition of growth during the first 24 hours. This was in many instances largely overcome within 3 days, but in few cases did the growth equal that in the control tubes. The inhibition was not directly associated with surface tension. In many instances the greatest inhibition occurred at the highest surface tension, while the broths of the lowest surface tension gave the maximum development in the reduced surface tension series. This is considered to indicate that inhibition was due to the chemical nature of the depressant rather than to the reduced surface tension.

In studies of udder infection a high bacterial count was noted with a predominating flora of streptococci in all cases. Two types of culture media were found to be well suited to the growth of streptococci found in udder infections, one a liver infusion agar prepared in a similar manner to any meat infusion agar, the other being a dextrose serum agar. Serum sterilized by filtration is added at the rate of 2 cc. per 10 cc. of dextrose agar. The reaction of both media is adjusted to a pH of 7 to 7.4. The colonies develop on these plates in 48 hours' time and are fished into other plates for further study.

The results obtained in the course of a study of the sterility of dairy cattle indicate that ice box temperatures are better for maintaining motility of the spermatozoa than either room temperature or body temperature. This is thought to be due to the restraint of bacterial growth which takes place at higher temperatures and probably exerts a deleterious effect on the sperm cells. It was demonstrated that there is a difference in H-ion concentration between the spermatic fluids of the bulls studied.

Arteriosclerosis in domestic animals, S. A. GOLDBERG (*Jour. Amer. Vet. Med. Assoc., 69 (1926), No. 1, pp. 31–47, figs. 21*).—The author here reports upon studies of 8 cases of varying degrees of arteriosclerosis. He finds that the etiology may to some extent be comparable to that in human arteriosclerosis, the lesions in many respects being similar to those occurring in man.

A new method of preparing foot-and-mouth disease antiserum and its effectiveness [trans. title], F. RUPPERT and A. ROTTGARDT (*Berlin. Tierärztl. Wohnschr., 42 (1926), No. 52, pp. 897, 898; abs. in Trop. Vet. Bul., 15 (1927), No. 2, p. 80*).—The authors drew blood in quantities of 6 and 8 liters, respectively, from year-old calves when at the height of temperature reactions resulting from intravenous inoculation. The blood was citrated to prevent clotting and injected intraperitoneally into two cows. Two weeks later the cows were bled and the serum obtained was mixed. This serum was sent from Argentina and tested on the island of Riems, Germany, where 0.1 cc. protected the guinea pig against a generalization of the disease.

In testing the serum on a large scale, 19 bovines were given 10 cc., 21 received 20 cc., and 20 received 30 cc. of the serum. There were 40 untreated controls. The animals were pastured in close contact with infected herds, and within a few days 40 per cent of the controls, but none of the treated animals, became infected. In a second test, in which 147 animals were treated in doses of 10, 20, and 30 cc. of serum, 3 animals which had received 10 cc. of the serum and 1 which had received 30 cc. became infected, as did about 60 per cent of the 225 controls. A third test was made with 15 animals, 5 receiving each of the 10, 20, and 30 cc. doses as previously administered. When kept with 458 animals, 60 per cent of which had the disease, none of the protected animals became infected.

Tuberculosis, its extent and eradication, J. A. KIERNAN (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 808–824, figs. 9*).—A report by the Chief of the Tuberculosis Eradication Division, U. S. D. A. Bureau of Animal Industry.

Avian tuberculosis eradication from the standpoint of public disease control, C. H. HAYS (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 907–916*).—A contribution by the State veterinarian of Nebraska.

Avian tuberculosis infection in mammals other than swine, L. VAN ES (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 775–780*).—This paper includes a report of the distribution of avian tuberculosis infection in animals other than swine, summarized in tabular form.

The development of bovine tuberculosis control measures in Canada, G. HILTON (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 825–832*).—An account of control measures by the veterinary director general of Canada.

Intradermic tuberculin reactions, W. J. FRETZ (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 763–774, figs. 6*).—A discussion of the interpretation of intradermic reactions.

Effect of adsorbents upon potency of tuberculin, M. DORSET, R. R. HENLEY, and H. E. MOSKEY (*Jour. Amer. Vet. Med. Assoc., 70 (1926), No. 3, pp. 373–377, fig. 1*).—In this contribution from the U. S. D. A. Bureau of Animal Industry the authors report experiments which have shown that the reaction of the adsorbent itself is of much importance, and that the active constituents of tuberculin are adsorbed by substances having a negative charge while they are not adsorbed to any noticeable degree by calcium carbonate, which carries a positive charge.

Excretion of antiseptic dyes through the mammary gland, V. BURKE and E. A. RODIER (*Jour. Infect. Diseases, 40 (1927), No. 6, pp. 673–676*).—In the studies conducted, neutral acriflavine was excreted through the mammary gland of the cow following the intravenous injection of from 7 to 11 mg. per kilogram, the milk being well colored. Although the experiments failed to demonstrate an increase in the bacteriostatic action of the milk following the intravenous injection of neutral acriflavine, there is reason for believing that injection of the dye may affect the organism in the udder. The intravenous injection of gentian violet caused more severe reactions than acriflavine, and mercurochrome caused still more severe and prolonged symptoms. Apparently these dyes were not excreted by the mammary gland.

The parasite problems of the live stock industry in the United States and in Central America, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 935–946*).—A report of the survey of parasites of livestock made by the author in Central America.

Ways to save young livestock (*U. S. Dept. Agr. Leaflet 1 (1927), pp. 5, figs. 4*).—A practical discussion of the means for preventing stunted growth and death losses among young livestock.

Inspection of dressed meats, J. RENNES (*Inspection des Viandes de Boucherie. Paris: Libr. E. le François, 1926, 3. ed., pp. [4]+224, pls. 31*).—This is the third edition of the work previously noted (E. S. R., 24, p. 68).

The protozoan fauna of the rumen and reticulum of American cattle, E. R. BECKER and M. TALBOTT (*Iowa State Col. Jour. Sci., 1 (1927), No. 3, pp. 345–371, pls. 3*).—This is chiefly the report of a survey of the protozoan fauna of the rumen and reticulum contents of 26 cattle slaughtered in the abattoir at Ames, Iowa. The results indicate that with the exception of three new species of Bütschlia about the same general types of protozoa are found in American cattle as in cattle in the Old World. A key to the protozoa inhabiting the rumen and reticulum of cattle is appended.

Evidence that nutritional deficiencies are factors in the problem of abortion and sterility in dairy cattle, E. B. MEIGS (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 855–866*).—A discussion of the relation of nutritional deficiencies to abortion and sterility, contributed by the U. S. D. A. Bureau of Dairy Industry.

Results of injecting pregnant heifers with Brucella abortus isolated from man, C. M. CARPENTER (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 4, pp. 459–468, figs. 4*).—This is in continuation of the author's studies of undulant fever (E. S. R., 55, pp. 575, 576). An intravenous injection of 10 cc. of a physiological saline suspension of each of 5 strains of *B. abortus*, obtained from as many cases of undulant fever in man, was given respectively to 5 pregnant heifers that did not react to the agglutination test and that were purchased from small herds where infectious abortion was not apparent.

All 5 heifers aborted from 5 to 20 days after receiving the culture, and the organism was recovered from the fetus, placenta, and colostrum in each case. One heifer, that was not destroyed until 231 days after aborting, still harbored the organism in its udder and eliminated large numbers in the milk.

The value and need of uniform methods for conducting tests for bovine infections abortion, with an account of experimental work, C. P. FITCH (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 866–874, figs. 4*).—The importance of uniform methods is discussed.

Johne's disease, infectious diarrhea of cattle, H. MORRIS (*Louisiana Stas. Bul. 200 (1927), pp. 8, figs. 3*).—A brief summary of information on this disease of cattle, a case of which has been definitely diagnosed in Louisiana.

Malignant foot-and-mouth disease in goats, A. HONEKER and J. FORTNER (*Die Bösartige Maul- und Klauenseuche bei Ziegen. Hanover: M. & H. Schaper, 1927, pp. 67, figs. 34*).—An account of studies of the virulent form of foot-and-mouth disease in goats, by Honeker (pp. 5–49), followed by an account of patho-anatomo-histological findings in the virulent form in goats, by Fortner (pp. 53–66).

Observations on the duration of cholera immunity in baby pigs following serum and virus treatment, R. GRAHAM, I. B. BOUGHTON, and E. A. TUNNICLIFF (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 4, pp. 448–457, fig. 1*).—Observations on the duration of immunity in two groups of pigs, including 304 animals in 1923 and 185 in 1924 that were immunized to cholera as baby pigs and exposed at market age, show that approximately 90 per cent retained immunity to cholera.

The prevention of roundworms in pigs (*U. S. Dept. Agr. Leaflet 5 (1927), pp. 8, figs. 6*).—This is a revision by M. C. Hall and H. B. Raffensperger of a mimeographed article by B. H. Ransom, issued July 1, 1921, on the so-called McLean County, Ill., system for preventing worm infestation in swine, worked out by the Bureau of Animal Industry.

[Report of work in poultry pathology at the New Jersey Stations], F. R. BEAUDETTE and J. J. BLACK (*New Jersey Stas. Rpt. 1926, pp. 389–400*).—The first part of this report deals with the diagnoses made of 1,466 diseases in 1,123 birds which originated from 407 different farms, and of 387 cases handled by letter. It appears that bacillary white diarrhea was the most common infectious disease of fowls, fowl cholera and fowl typhoid continuing to be very common. *Bacillus aertrycke* was found for the first time to be the cause of an infectious disease of young chickens.

In a study made of the resistance of the eggs of *Ascaridia perspicillum* to the common disinfectants, it was found that a 1:1,000 solution of bichloride of mercury, a 5 per cent solution of formaldehyde, and a 5 per cent solution of

hydrochloric acid did not affect the eggs, for the experimental birds placed on infested soil treated with these agents became infested. It was found, however, that birds placed on infested soil treated with a 5 per cent solution of phenol remained free of nematodes.

The effect of acid soils on the viability of *Bacterium sanguinarium* was studied, and it was found that this organism would not live a week in a soil as acid as pH 6.2 or lower, while the organism in soil of pH 7.0 was still viable after 16 weeks.

In a study of the avian paratyphoid organism, the infection was found in the canary bird, pigeon, goldfinch, bullfinch, strawberry finch, mule canary, European siskin, white canary, and parrot. Finally the infection was found in young domestic fowls.

In control work with bacillary white diarrhea, 21,241 birds were tested, in which a total of 9.01 per cent were found infected. A report of this work from another source has been noted (E. S. R., 55, p. 878).

The distribution of diseases in 353 cases examined at the Vineland laboratory is reported upon in tabular form, as is the distribution of diseases in 105 cases of birds from the Vineland egg-laying contest.

In experimental work with kamala for tapeworm control, it was found to be a severe treatment, and when given after or without fasting, in plain gelatin capsules, a high mortality resulted. When the capsules were coated with any material that prevented the liberation of the drug in the crop and the treatment was followed with salts, only those birds died that were affected with other conditions, as tumors, ovarian abnormalities, visceral gout, etc. In all cases where laying birds were treated, egg production stopped for two weeks. The culled birds treated were in very poor condition and probably would have died in a short time. The majority of the birds recovered and were returned to the laying flock or sent to market.

Report of committee on poultry diseases, L. Van Es et al. (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 920–925*).—This report, listed from another source (E. S. R., 57, p. 179), considers avian tuberculosis and bacillary white diarrhea, with general conclusions and tentative recommendations as to the making of the agglutination test for bacillary white diarrhea control.

Heterakis vesicularis Frölich 1791: A vector of an infectious disease, E. E. Tyzzer (*Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 8, pp. 708, 709; abs. in Trop. Vet. Bul., 15 (1927), No. 1, p. 16*).—The author finds that blackhead, caused by *Histomonas meleagridis*, is transmitted experimentally and to some extent in nature by direct ingestion of material contaminated with freshly passed discharges containing the protozoan. The presence of the protozoan in the egg of Heterakis is indicated by experimental evidence of various kinds. Heterakis eggs kept in 1.5 per cent nitric acid until embryonated, in order to render the eggs bacteriologically sterile, were found to produce blackhead in young birds isolated from other sources of infection.

Two basic factors in coccidial infection of the chicken, W. T. Johnson (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 5, pp. 560–582*).—This is a contribution from the Oregon Experiment Station in which the author concludes that the severity of coccidiosis in fowls of equal susceptibility to coccidial infection is chiefly dependent upon the size of the dose of sporulated oöcysts when sporulation takes place in 2.5 per cent potassium bichromate. The disease runs a limited course, and most fowls completely expel the parasite in the feces within approximately a month following inoculation.

On the rôle played by dragon flies in the transfer of Prosthogonimus, A. KOTLAN and W. L. CHANDLER (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 4, pp. 520–524, fig. 1*).—Following the discovery of a newly recognized fluke disease of fowls, as previously noted (E. S. R., 55, p. 778), the authors examined a large number of insects and snails for the presence of larval stages of flukes. In the course of the study they discovered a number of encysted larval flukes (metacercariae) in the abdominal cavity of the larvae of at least four species of dragon flies which were fed to chickens, as were adult dragon flies. The results show that the dragon fly in both the larval and adult stages harbors the infestive stage of this fluke. The difference in the cysts suggests the possibility that they may represent two different fluke species, one of which, however, belongs to Prosthogonimus.

An enzootic salpingitis of pullets, with special reference to Salmonella pullora infection, H. BUNYEA (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 5, pp. 645–651*).—The studies reported in this contribution from the U. S. D. A. Bureau of Animal Industry led to the conclusion that *S. pullora* infection in adult hens and pullets may assume the character of a bacteremia, with primary lesions of peritonitis. In its enzootic form the infection may bring about a salpingitis among heavy-laying pullets, manifested by offensive eggs, blood-spotted eggs, blood-smeared shells, soft-shelled eggs, cloacitis, white diarrhea, and the practice of cannibalism within the flock. Isolation and local treatment tend to convalescence, when the infection may recede, in the course of 2.5 months, to its favorite habitat, the ovary. Complete disappearance of *S. pullora* infection from the surviving bird occasionally occurs in that period. Incipient cases may often be detected by the intradermic and agglutination tests. Agglutinating fluids made with strains of *S. pullora* from hens produce more sensitive reactions than those of baby-chick origin when tested against the serum of infected hens. Salpingitis appears to result from activation of latent inherent infection in the individual. It is not readily disseminated among adult birds.

Results of white diarrhea investigations, B. A. BEACH, J. G. HALPIN, and C. E. LAMPMAN (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 5, pp. 605–609*).—This contribution from the Wisconsin Experiment Station was presented at the annual meeting of the American Veterinary Medical Association at Lexington, Ky., in August, 1926. In their work with 56 hens tested 11 times in 13 months varying reactions were obtained. The details are given in tabular form.

Studies in the diagnosis of bacillary white diarrhea, R. GRAHAM and E. A. TUNNICLIFF (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 5, pp. 612–627, figs. 6*).—The studies conducted at the University of Illinois here reported led the authors to conclude that the macroscopic agglutination test used in conjunction with the application of sanitary measures is a valuable means of control. Failure to reduce the loss in baby chicks from bacillary white diarrhea in some flocks is considered traceable to unsanitary premises, or to the purchase of infected day-old chicks or fowls infected with low antigenic strains that are not detected by the routine agglutination test.

An application of the rapid-method agglutination test to the diagnosis of bacillary white diarrhea infection, R. A. RUNNELLS, C. J. COON, H. FARLEY, and F. THORP (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 660–662*).—In this contribution from the Virginia Polytechnic Institute the authors describe a rapid method for making the agglutination test which is considered more adaptable to field use than the slow method.

The control of bacillary white diarrhea, R. A. CRAIG (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 6, pp. 916–920*).—A contribution from the Indiana Experiment Station.

Anthelmintic efficiency of kamala and tetrachlorethylene in the treatment of chickens, A. S. Schlingman (*Jour. Amer. Vet. Med. Assoc., 70 (1927), No. 4, pp. 514–519*).—The results obtained in the experiments here reported, in which kamala was administered in 1-gm. doses to chickens, show that this drug is an efficient teniacide and is not toxic for birds weighing from 1 lb. to 6.5 lbs. When 1 cc. of tetrachlorethylene is given simultaneously with 1 gm. of kamala to chickens, the efficacy of the kamala as a teniacide seems to be reduced considerably, as is that of tetrachlorethylene for roundworms. Given at intervals of 3 days, tetrachlorethylene in doses of 1 cc. and kamala in doses of 1 gm. seems to be effective in removing roundworms and tapeworms from chickens.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Idaho Station] (*Idaho Sta. Bul. 149 (1927), pp. 16, 17*).—Preliminary studies of the rate of infiltration of water into soils indicated a very definite relation between the depth of water absorbed and the time during which the water stands on the soil surface. This relation appears to be expressed by the formula $D=cT^n$, in which D equals the depth of water infiltrated in feet, T equals the time of infiltration in hours, c equals a coefficient varying from 0.038 to 1.7 and n equals an exponential factor varying from 0.2 to 0.87. Variations in the rate of infiltration from 0.038 ft. per hour to 0.23 ft. per hour occurred within a distance of less than 100 ft. on the alkali soils of the tract used in the project on reclamation after drainage. Tests on the Palouse silt loam indicated a rate of 1.7 ft. per hour.

Studies of the effect of various treatments on the leaching out of alkali salts from drained land indicated that planting with sweet clover and repeated leaching will serve to reclaim land that is not extremely impervious and that has satisfactory underdrainage. Infiltration trials showed that the rate at which the good and bad spots in the soil took up irrigation water varied greatly. It is evident from these results that the rate of leaching in soils of individual plats will be far from uniform.

A survey of the use of electricity on Idaho farms showed that about 7,000 out of the total of 40,000 farms in the State are supplied with central station electric service. These farms are very largely concentrated in the irrigated sections of the State, where the extensive use of electric energy for irrigation pumping has made possible the wide distriblution of electric service. Decidedly more energy is used per month on farms served by the commercial power companies than on those served by the mutual companies on the Minidoka project.

Irrigation in relation to soil moisture and plant growth, F. J. Veihmeyer (*Agr. Engin., 8 (1927), No. 5, pp. 109–111, figs. 4*).—This is an abstract of a paper presented at the twentieth annual meeting of the American Society of Agricultural Engineers at Lake Tahoe, Calif., which reported the results of studies conducted at the California Experiment Station on the behavior of soil moisture as regards its movement in the soil due to capillarity, evaporation from exposed soil surfaces, and the reaction of certain plants to different amounts of soil moisture under California conditions. It is pointed out that the findings are rather sharply at variance with the preponderance of previously existing views on these subjects.

It was found that when soils are not in contact with free water capillary movement is extremely slow in rate and slight in amount. Cultivation was found to have a negligible influence on the amount of evaporation from clay loam soils packed in tanks. It was noted that the rapid loss of water by

evaporation during the first few days following the application of water took place chiefly before the soil was fit to cultivate.

No real differences in soil moisture behavior between cultivated and uncultivated plats were noted at four different localities representing a wide range of climatic conditions. Furthermore, no significant loss of moisture occurred from the soil depth zone of 3 to 6 ft. The losses were confined almost entirely to the surface foot of soil, largely in the upper 8 in. and mostly from the first 4 in. The amount and rapidity of moisture dissipation by moisture transpiration from growing crops were in sharp contrast to the extremely small and slow loss of soil moisture by evaporation.

The belief is expressed that many of the conclusions drawn from studies concerning the water relations of plants grown under supposedly constant soil moisture conditions are erroneous, and that most work of this nature is not free from the doubt that the uniform percentage of soil moisture assumed actually was maintained.

Daily river stages at river gage stations on the principal rivers of the United States, H. C. Frankenfield (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 24 (1926), pp. IV+185*).—This is the twenty-fourth of these reports (E. S. R., 56, p. 177), and presents data for 1926.

Surface water supply of Pacific slope basins in California, 1922 (*U. S. Geol. Survey, Water-Supply Paper 551 (1927), pp. VIII+405, pls. 2*).—This report, prepared in cooperation with the States of California and Oregon, presents the results of measurements of flow made on streams in these basins during the year ended September 30, 1922.

Studies on the changes occurring in the vegetation of salt marsh areas, T. J. Headlee and F. W. Miller (*New Jersey Stas. Rpt. 1926, pp. 240–243*).—A study of changes in vegetation due to diking and drainage in salt marshes indicated that the disappearance of the salt grasses and sedges, desirable as salt hay, and their replacement by a vegetation consisting mostly of golden rod and dog weed was due for the most part to the removal by rain-water leaching of very large amounts of salt contained in these soils, so that this constituent was reduced below the optimum for the desirable salt grasses, and a condition similar to that of fresh-water swamps was approached. It was also observed that when the salt was removed the silt and clay also disappeared, the salt having acted as a binding material. Besides the changes in plant population, diking resulted in the deposit of fine sludge in ditches, caused meadow shrinkage, and produced softening of the ditch banks.

Federal legislation providing for Federal aid in highway construction and the construction of national forest roads and trails. Rules and regulations of the Secretary of Agriculture for carrying out the Federal Highway Act and amendments thereto. Rules and regulations for administering forest roads and trails (*U. S. Dept. Agr., Misc. Circ. 105 (1927), pp. [1]+30*).—The texts of the legislation and of the rules and regulations are presented, revising an earlier compilation (E. S. R., 54, p. 876).

Farm explosives, R. N. Miller (*Wash. State Col. Ext. Bul. 142 (1927), pp. 27, figs. 30*).—Practical information on the use of farm explosives, particularly pyrotol, is presented.

Steel construction, H. J. Burt (*Chicago: Amer. Tech. Soc., 1927, pp. 396, figs. 246*).—This is a text and reference book covering the design of steel framework for buildings. It contains sections on method of manufacture, steel sections—adaptability and use, quality of material, unit stresses, rivets and bolts, beams, riveted girders, compression members—columns, tension members, wind bracing, practical design—a sixteen-story fireproof hotel, protection of steel, and specifications.

Electricity in agriculture, I, II, C. A. C. Brown (*Jour. Min. Agr.* [*Gt. Brit.*], *34* (*1927*), *Nos. 2, pp. 121–125; 3, pp. 258–262*).—Data on the development of the use of electricity in agriculture in England are briefly presented. Some of the subjects discussed are the supply and distribution of the energy, the uncertainty of the farming load, and the use of the electricity on the farm.

Electric power transmission, A. Still (*New York and London: McGraw-Hill Book Co., 1927, 3. ed., rev., pp. XVII+412, figs. 139*).—This is the third revised edition of this book. It contains chapters on transmission line problems, calculations for short transmission lines, economic principles, mechanical principles—overhead conductors, overhead conductors—sag and stress calculations, transmission line supports, insulation of overhead transmission lines, electrical principles and calculations, voltage control—electrical calculations for long transmission lines, corona—abnormal pressure rises—lightning protection, transmission of energy by continuous currents, and transmission of energy by underground cables.

Hydro-electric handbook, W. P. Creager and J. D. Justin (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, pp. XXIV+897, pls. 7, figs. 488*).—The purpose of this handbook is to present a compendium of all phases of modern hydroelectric practice. It contains chapters on rainfall; evaporation; factors affecting run-off; estimating stream flow; flood flows; capacity of the development; output capacity and flow demand; storage and power available; hydraulics; general design; timber dams; masonry dams; earth dams; rock-fill dams; headwater control and accessories for dams; conduit intakes; conduits; canals; flumes; steel pipe; wood-stave pipe; concrete pipes; tunnels; water hammer; surge tanks; power house substructure; power house superstructure; hydraulic turbines; electrical design; generators, exciters, and transformers; switching equipment, station wiring, and auxiliary power and lighting; transmission lines; investigations and reports; river gauging; and operation of hydroelectric properties.

Effect of moisture on electrical properties of insulating waxes, resins, and bitumens, J. A. Lee and H. H. Lowry (*Indus. and Engin. Chem., 19* (*1927*), *No. 2, pp. 302–306*).—Studies are reported in which measurements of the dielectric constant and effective conductivity at 1,000 cycles and resistivity were made on 31 waxes, resins, and bitumens. These materials included not only natural products but commercial dielectrics and mixtures. The measurements were taken for the initial thoroughly dry condition, after six months' immersion in a salt solution corresponding qualitatively to exposure to 98 per cent relative humidity, and after having been redried.

All of the insulating material studied absorbed water under the conditions of the experiment. The absorption was least with the hydrocarbons and greatest with shellac and bayberry wax. In general the greatest increase in capacity and conductivity and the greatest decrease in resistivity were shown by the materials which absorbed the most water. The percentage change was much greater in the conductivity and resistivity than in the dielectric constant.

Gaseous explosions.—III, Effect of fuel constitution on rate of rise of pressure, G. G. Brown and G. B. Watkins (*Indus. and Engin. Chem., 19* (*1927*), *No. 2, pp. 280–285, figs. 5*).—In a third contribution to the subject from the University of Michigan, apparatus suitable for the quantitative determination of the rate of rise of pressure of a gaseous explosion is described. Normal hexane, heptane, and octane; benzene, toluene, and xylene; methyl, ethyl, and amyl alcohols; and ethyl ether were used to prepare explosive mixtures with substantially theoretical oxygen and nitrogen. These mixtures were exploded under constant initial conditions, and the pressure-time curves were graphically differentiated to obtain the maximum rate of rise of pressure.

A comparison of the data for the fuels tested indicated that the rate of rise of pressure in a progressive homogeneous reaction increases with the molecular weight in the paraffin series and varies inversely with the number of methyl groups added to the benzene ring in the aromatic series. It is approximately the same for normal octane and benzene, for normal heptane and toluene, and for normal hexane and xylene, and is about the same for the higher alcohols as for the corresponding paraffin hydrocarbons. It is also exceedingly rapid for ether.

Comparison of gasolines by analytical and engine tests, D. R. Stevens and S. P. Marley (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 228-231, fig. 1*).—Studies conducted at the Mellon Institute of Industrial Research are reported in which 18 gasolines composed entirely of petroleum were analyzed for their content of paraffins, naphthenes, aromatics, and unsaturated hydrocarbons. The same gasolines were then tested for detonating tendency by engine tests, using a direct-reading detonation indicator. A comparison of the benzene equivalents calculated from analysis with those determined by engine tests showed that the agreement was fair for about half the fuels studied, but that rather wide discrepancies occurred in the other cases.

It is concluded that the antiknock values of gasolines can not be satisfactorily determined by this method. When using pure hydrocarbons an equivalence in knock reduction of approximately 2:2:1 was found for a naphthene, an olefin, and an aromatic hydrocarbon, as represented by methylcyclohexane, hexylene, and toluene. Qualitative evidence was also found that there are striking differences in the detonating tendencies of the paraffin hydrocarbons present in different gasolines. Normal heptane was found to knock harder than petroleum paraffins, and this may indicate the desirability of branched-chain paraffins as motor fuels.

Influence of an antiknock compound in a gas-ion oxidation, S. C. Lind and D. C. Bardwell (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 231-233*).—Studies conducted at the U. S. D. A. Fixed Nitrogen Research Laboratory are reported which showed that the actual comparison of the rates, with and without diethyl selenium, of the slow oxidation of methane under the ionizing influence of alpharadiation does not indicate any retardation by the antiknock compound but rather some acceleration. The interpretation of this and its possible bearing on the antiknock theory are discussed.

Acids in automobile crank cases, A. F. Meston (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 312-315, figs. 2*).—Studies are reported which showed that an acid condition is always present in an automobile crank case. Acids were found in the lubricating oil, in the diluents in the oil, and in the vapors escaping from the crank case. Some of the acids were more soluble in water than in oil, and some were corrosive. Positive tests for naphthenic acids were obtained with oils, diluents, and condensed water vapors. The neutralization value of a crank case oil apparently reaches a maximum after the oil has been in service for several hundred miles of operation. The presence of sulfur is noted, and data are presented relating to its distribution in the various liquids and vapors.

The combined reaper-thresher in western Canada, J. K. Mackenzie (*Canada Dept. Agr. Pamphlet 83, n. ser. (1927), pp. 14, figs. 10*).—The results of experiments at the Dominion Experimental Station, Swift Current, Sask., are reported, together with the results of a survey of the experience of owners of combines.

The general conclusion is drawn that the minimum acreage for which a combine is purchased should not be less than 300 acres unless the purchaser intends to do custom work. The maximum acreage for a combine in one season can not safely be placed above 800 to 1,000 acres.

The waiting period between binder harvesting and combine harvesting may vary from 8 to 20 days, depending on climatic conditions. With Marquis wheat there was found to be usually very little additional loss from shelling by waiting until the proper time to harvest with the combine. Any loss sustained is generally offset by the smaller loss incurred in handling the crop with the combine. It was found that wheat damaged by the sawfly can be picked up as well by the combine as by the binder. The only apparent cause of loss from using the combine is in the case of a thin crop infested with green weeds.

It was further found that a heavy crop flattened out by storms can be harvested more easily by the combine than by the binder. By traveling slowly, overloading of the threshing mechanism can be avoided. In general, a bad season for the combine is also a bad season for the binder and separator. Following a rain the combine can be started sooner than the separator.

A thresher for the plant breeder and the cereal chemist, W. O. WHITCOMB (*Jour. Amer. Soc. Agron., 19 (1927), No. 4, pp. 265–270, figs. 5*).—In a contribution from the Montana Experiment Station a thresher for use by the plant breeder and cereal chemist is described and illustrated which has no toothed concave and in which the cylinder is mounted directly on the motor shaft. The power required to operate both the thresher and the fanning mill can be supplied by a 0.25 h. p. electric motor, with a speed of 1,150 r. p. m. The best speed for the cylinder was found to be from 1,200 to 1,400 r. p. m. The removal of the grain drawer for each plant or other unit prevents the mixing of the grain. It was found that two men working with the thresher and fanning mill combined can thresh from 4 to 6 plants per minute.

[Ditch cleaning and cutting machinery], T. J. HEADLEE and F. W. MILLER (*New Jersey Stas. Rpt. 1926, pp. 243, 244, pls. 4*).—A motorized ditch-cleaning machine and machines for ditching for land drainage in connection with the mosquito control work at the station are described and illustrated.

Refrigeration in the chemical industry, G. W. DANIELS (*New York: D. Van Nostrand Co., 1926, pp. [6]+141, figs. 39*).—The scope of this book is such as to permit the formation of some correct quantitative ideas of the capabilities of refrigerating plants and of the amount of refrigeration necessary for a given purpose. It contains chapters on some fundamental points, properties of refrigerants in use, calculation of capacity and power, calling for tenders, choice of a machine, condensers, cooling of liquids, cooling of gases, insulation, operation of refrigerating plant, choice of a prime mover, and chemical processes using refrigeration.

Timber cottages for rural districts, E. GUNN (*Jour. Min. Agr. [Gt. Brit.], 33 (1927), No. 11, pp. 1007–1010, fig. 1*).—Information on the development of timber cottages for the use of agricultural laborers in England is presented, together with simple working drawings. Timber is considered better than brick or concrete as a nonconducting material for use in the construction of laborers' cottages in cold countries.

The painting and preservation of poultry buildings, W. C. THOMPSON (*New Jersey Stas. Hints to Poultrymen, 15 (1927), No. 10, pp. 4, fig. 1*).—Practical information on the subject is given.

Report of the Sewage Substation, W. RUDOLFS ET AL. (*New Jersey Stas. Rpt. 1926, pp. 409–520, figs. 48*).—This report includes several papers noted below.

Effect of lime on sludge digestion, W. Rudolfs, H. Heukelekian, P. J. A. Zeller, D. Peterson, and J. R. Downes (pp. 412–443).—Studies are reported which showed that the effect of lime on sludge digestion is pronounced, influencing the flora and fauna and consequently the chemical intermediate and

end products. Lime also changes the physicochemical relation in sewage solids, so that the solids are differently distributed in the liquid phase with different reactions. In general, lime additions up to a certain point stimulate the numbers of bacteria, but maximum numbers do not necessarily mean maximum digestion. With higher reactions, above pH 7.6, great fluctuations in bacterial numbers occur, indicating a condition of instability. At these higher reactions the odors emanating from digesting material are stronger. The numbers of protozoa decrease markedly when the reaction of the digesting material is changed from pH 7.2 to 7.6, and higher reactions cause rapidly alternating increases and decreases. However, the variations of pH values between 7.2 and 8.8 have no limiting effect on the variety of species.

Liquefaction was found to overbalance mineralization at pH 7.2, but the reverse is true at reactions of pH 7.6 and above. The most rapid and satisfactory digestion proceeds at pH values of from 7.3 to 7.8. If the reaction of incoming fresh solids is kept at pH 7.3 to 7.6, odors are practically absent.

Daily additions of fresh solids kept at pH values of from 7.3 to 7.6 can be increased from 2 to 3.5 per cent of dry solids, and possibly to 5 per cent, reducing the relation of ripe sludge necessary for efficient digestion from 50 to 1 of fresh solids daily to 30 to 1, and possibly to 20 to 1.

Unadjusted but properly seeded material requires a per capita digestion space in summer of not less than 2.6 to 2.7 cu. ft. With reaction control this per capita effective digestion capacity can be reduced under these conditions to 1.4 to 1.5 cu. ft.

Imhoff tanks (pp. 443–462).—Experiments with three Imhoff tanks are reported which dealt especially with the influence of reaction on zoological, chemical, and bacteriological characteristics.

It was found that the solids retained in the tanks increased greatly because of an effort of the operator to improve the character of the effluent. A comparison of two of the tanks, one treated with lime and the other untreated, showed that the treated tank gave no sign of foaming and was free from scum for several months in spite of the fact that it was continuously operating, whereas the untreated tank had to rest and could not be put into operation for a long time on account of heavy foaming. Gas production and composition were found to change with the operation or resting of a tank. During the first few days of operation after a prolonged resting period, methane production was the highest. Protozoa increased in direct proportion to the percentage solids increase, but bacterial numbers reached their peak before the percentage solids was highest.

Separate sludge digestion tank experiments (pp. 463–480).—Experiments in a separate sludge digestion tank with a capacity of 25,000 cu. ft. are reported, and the results compared with those obtained in an Imhoff tank.

On the assumption that at least 100 days' sludge storage capacity is required for Imhoff tanks, the covered separate sludge digestion tank did as well as a good working Imhoff tank. It appeared that the reaction of the contents of a tank can be controlled with a greater degree of accuracy in separate sludge digestion tanks and that the daily addition of definite quantities of fresh solids to ripe sludge is simpler. It is also easier and more economical to apply heat to a separate sludge digestion tank than to an Imhoff tank.

Amounts of lime necessary for adjustment of fresh solids and material in digestion tanks (pp. 481–489).—Data are presented to show the amounts of lime necessary to adjust the reaction of incoming fresh solids of different concentration, and examples are given for the correction of poorly working acid tanks. Lime, if needed, should be added daily to fresh solids going to separate

sludge digestion tanks, and is preferable also for Imhoff tanks because it is more economical and produces better results.

General discussion on the effect of lime on sludge digestion (pp. 489–498).—The data obtained at the station are summarized and discussed, indicating that in the effect of lime on digestion several factors are of more or less importance, including its effect on the activities of microorganisms, chemical reactions induced, and the change in the physical condition of the digesting material. The effect on the activities of microorganisms may be to make the medium more favorable for acid-producing organisms, to induce the establishment of a predominantly different flora, or to make the medium less or more favorable for protozoa. Chemically lime affects the organic and mineral acids and under certain circumstances favors the liberation of ammonia. Physically it flocculates the finely divided materials, changing the viscosity, and affects the surface tension of the liquid.

Studies on film accumulation in the sprinkling filter bed, W. Rudolfs and D. Peterson (pp. 498–505).—Data collected on old and new film throughout one year showed fluctuations, but with a general trend. The average amount of wet film deposited upon a tile each week weighed approximately 3.5 gm., with a variation of from 2 to 5 per cent solids. The rate of film deposit was not uniform throughout the bed in regard to total deposit, amount of solids, and percentage of ash. The older film showed a fluctuating but gradual increase in solids content from one sloughing period until the next, with an increasing percentage of ash. The action and efficiency of new and old film throughout the bed changed according to its accumulation. It is suggested that the design of a filter bed should depend on the amounts of solids to be handled.

Distribution and succession of protozoa in Imhoff tanks, J. B. Lackey (pp. 506–520).—These studies showed that flagellates are far more numerous than ciliates in Imhoff tanks. Vertically, flagellates are present in maximum numbers usually between 5 and 7 ft. There is no definitely located point for the ciliate maximum, and as yet no proof of a well-defined seasonal succession for any of the protozoa. It was found that tanks which are not foaming have relatively small protozoan populations. The numbers of protozoa decrease to the point of defaunation in tanks which are shut off, and conversely they increase enormously if a tank runs indefinitely. Their numbers are independent of the observed ranges of H-ion concentration and temperature in the tanks. They are largely sapropelic forms, so that a continuously running tank offers a constant food supply for them. There is an absolute correlation between large increases in their numbers and foaming, although no definite explanation is available for the part they take in foaming.

Some chemical characteristics of sewage sludge, S. L. Neave and A. M. Buswell (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 233, 234, fig. 1*).—In a contribution from the Illinois State Water Survey Division data on the chemical characteristics of sewage sludge are presented which include such factors as volatile matter, fixed carbon, grease, nitrogen, carbohydrates, and peptization.

Practical application of hydrogen-ion control in the digestion of sewage sludge, S. E. Coburn (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 235, 236, fig. 1*).—Data are reported which indicate the undesirability of starting a new Imhoff tank plant in the late fall when bacterial action is inhibited by low temperatures. Considerable amounts of grain mash were found to tend to promote the acid digestion of the sewage solids. Seeding was found to be of no value unless a sufficiently large amount of good sludge is used. It was found

that even under unfavorable conditions it is practicable to control the H-ion concentration of the sludge in an Imhoff tank by the judicious application of hydrated lime and thereby obtaining a pH value of from 7.3 to 7.6, which is favorable to satisfactory sludge digestion.

Effect of temperature on sewage sludge digestion, W. Rudolfs (*Indus. and Engin. Chem., 19 (1927), No. 2, pp. 241–243, figs. 3*).—Studies conducted at the New Jersey Experiment Stations are briefly reported which showed that digestion of sewage sludge is extremely slow at temperatures below 10° C. (50° F.). Raising the temperature a few degrees above 10 has comparatively little effect, but the digestion time is materially decreased with higher temperatures. The maximum digestion was found to take place at about 27–28°. Definite quantities of organic material present in sewage produced about the same volume of gas at all temperatures. The volume of gas produced from the same sewage sludge can be increased by changing the reaction of the medium and the composition of the gas, which is due to a preponderance of different organisms.

It was found that in a given time the average number of bacteria per gram of organic matter in unadjusted sludge does not increase with an increase in temperature, whereas the average numbers of bacteria in sludge treated with lime decrease with the increase in temperature. In the same given time the numbers of protozoa follow the bacterial numbers.

The time of digestion was found to be further decreased by maintaining a proper reaction in the material corresponding to a pH of from 7.3 to 7.6. The composition of the gas changes with the reaction of the medium.

Solving sewage problems, G. W. Fuller and J. R. McClintock (*New York and London: McGraw-Hill Book Co., 1926, pp. X+548, pl. 1, figs. 83*).—A concise presentation is given of the fundamental principles of sewage purification and disposal. Sufficient details as to the arrangement of new plants are given to indicate recent advances in the art. Chapters are included on outline of problems; legal and legislative aspects; administrative aspects; characteristics of sewage; basic design data—rational methods; biochemistry of sewage; limitations of dilution method—nuisance aspects; hygienic aspects; natural purification of streams; oxygen balance—residual oxygen; plankton—biological balance; lakes, oceans, and tidal estuaries; procedures for overcoming limitations of dilution method; collecting system factors; grit chambers; screens; skimming tanks; plain sedimentation; plain sedimentation tanks; disposal of undigested sludge; septicization and gasification; single story septic tanks; two-story septic tanks; separate sludge digestion; gas collection and utilization; disposal of digested sludge; chemical precipitation; electrolytic methods—direct oxidation; chlorination; broad irrigation; fishponds; subsurface irrigation; intermittent sand filters; contact filters; trickling filters; final settling tanks; activated sludge process; activated sludge plants; disposal of activated sludge; activated sludge as fertilizer; and a nontechnical summary.

A simple and successful septic tank, E. J. van Meerten (*Union So. Africa Dept. Agr. Bul. 15 (1927), pp. 11, fig. 1*).—Data on the planning and construction of a septic tank and sewage purification system which is particularly adapted to South African conditions are presented. It is noted that the walls of the tank are built of 9-in. brickwork, the compartments being 4 ft. square inside. It is stated that, for the purpose used, concrete is generally more expensive than either stone or brick and no more satisfactory. A French drain is included in the system.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the New Jersey Stations, 1926], A. G. WALLER (*New Jersey Stas. Rpt. 1926, pp. 63–71*).—The work in agricultural economics is reviewed, and preliminary reports are included as follows:

Potato farms in New Jersey.—Farm business records obtained from 48 of the more successful farms in central New Jersey for 1914 are compared with records from the same farms in 1924. These show decreases of 3.1 acres in the average area cropped, 4.3 acres in the average area in potatoes, and $1,271.69 in the average farm labor income. There was an average increase of $2,125.46 in total expenses. Ten of the farms had larger incomes in 1924 than in 1914.

Poultry farms in New Jersey.—A comparison of farm business records obtained from 120 commercial poultry plants covering the year beginning November 1, 1924, and from 150 poultry farms for the poultry year 1915–16 showed an average investment of $14,477, an average net farm income of $2,057, and an average labor income of $1,333 in 1924–25 as compared with $7,243, $1,092, and $730, respectively, in 1915–16. The average size of the farms had increased from 11.6 acres with 4.6 acres in crops to 24.5 acres with 7.5 acres in crops. The percentages of the farms surveyed in 1925 having plus labor incomes increased with the average production per bird per year as follows: Less than 60 eggs, none; from 61 to 80 eggs, 23 per cent; from 81 to 100 eggs, 73 per cent; from 101 to 120 eggs, 89 per cent; from 121 to 140 eggs, 92 per cent; and over 140 eggs, 95 per cent.

Cost of producing can-house tomatoes.—A table is included bringing up to date figures in a bulletin previously noted (E. S. R., 45, p. 796), and showing costs per acre and per ton and yield per acre for 7 years between 1914 and 1925, inclusive.

An economic study of the dairy industry in Texas, G. L. CRAWFORD (*Texas Sta. Bul. 358 (1927), pp. 36, figs. 13*).—This bulletin gives the results of a study of the extent to which Texas is producing milk, butter, and ice cream for its own consumption, the possibility of profitably increasing the production, and the methods used in marketing dairy products. Suggestions are made for improving production and marketing.

Costs of storing corn on the farm, L. F. RICKEY (*Illinois Sta. Bul. 295 (1927), pp. 16, figs. 2*).—The items of cost and of profit in storing corn are discussed. Tables are included showing the results of tests made by the station on the percentage of shrinkage of ear corn by months from 1903 to 1913 and the shrinkage of shelled corn when the moisture content is reduced from high percentages to 12 to 17 per cent. Examples are given as to how to figure storage costs of corn sold in different ways.

Profitable farm combinations, G. W. FORSTER and R. J. SAVILLE (*North Carolina Sta. Bul. 252 (1927), pp. 46, figs. 11*).—This bulletin is based upon a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics of the organization of a number of representative farms in the lower Coastal Plain of North Carolina. The information was collected weekly by a route man. Data on yields and prices covering a period of years were also studied, and tables of yields and prices used for standard organizations compiled. The equipment, livestock, and cropping systems are suggested for standard farms with 40, 60, and 70 acres cropped, and tables and graphs are included showing the probable production, fertilizer and seed requirements, disposition of products, distribution of man labor and horse work, and the probable income from such standard farms.

The organization, production, man labor and horse work distribution, income, etc., of a farm with approximately 40 acres and one with approximately 70 acres are analyzed and compared with the probable results if the farms were reorganized to conform with the standard organizations.

India as a producer and exporter of wheat, C. P. WRIGHT, J. S. DAVIS, ET AL. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 3 (1927), No. 8, pp. [2]+317–412, figs. 16*).—A study of the production, consumption, marketing, and prices of, and the foreign trade in, wheat. The conclusion is reached that India shows no promise of becoming, in the near future at least, a continuously substantial contributor to the world wheat market.

British colonial competition for the American Cotton Belt, L. BADER (*Econ. Geogr., 3 (1927), No. 2, pp. 210–231, figs. 18*).—Fluctuations in the price of cotton, high prices for cotton during the past ten years due to the war and short crops, the belief that the United States' cotton crops are dwindling to where there will eventually be a world shortage of cotton, and the need to develop her African colonies have resulted in an urge in Great Britain to grow cotton within the Empire. The world's cotton crops from 1903 to 1925 by countries, the prices of cotton, the possibilities of increased production in India and British Africa, and the activities of the British Cotton Growing Association, the Empire Cotton Growing Committee, and the Empire Cotton Growing Corporation are described.

The author concludes that, if the cotton farmers of the United States can grow cotton to sell at from 12.5 to 15 cts. per pound, by the end of the next decade the world will be demanding 20,000,000 bales from the United States; and that Great Britain can be wisely counseled to develop cotton growing in Africa slowly, orderly, and only to meet the increase in demand for the product, and to spend the major portion of her time, effort, and money in finding new uses and markets for her manufactures of cotton rather than going into what may be uneconomic plans for increasing cotton production.

Group settlement of migrants in Western Australia, E. SHANN (*Econ. Rec., 1 (1925), No. 1, pp. 73–93, fig. 1*).—This article describes the conditions leading up to and the working of the group settlement plan instituted in Western Australia under an agreement signed in February, 1923, by the Secretary of State for the Colonies of the British Government, the High Commission of the Commonwealth of Australia, and the Premier of Western Australia for the development of the southwestern division of Western Australia. The group settlement plan provided that each member of the group should be entitled to advances from the State government in the form of wages; that the migrants found most suitable in a preliminary period of country employment should be organized into groups of 20 or less to prepare homestead blocks for occupation; that at least 25 acres of each farm should be made fit for plowing, and a house, necessary outbuildings, and fences should be constructed and a water supply arranged for by the collective labor of the group; that individual farms be allotted by ballot; and that each settler on taking possession of his farm undertake to repay the State for its expenditure in preparing, equipping, and stocking the farm, for interest paid by the State on such expenditure, and for a supervision charge not exceeding 7.5 per cent of the settler's total debt. It was also provided that the debt charge, including supervision, should not exceed £1,000.

The author points out, among other things, that the selection of group members on the basis of aptitude for farming has not been practiced; that group clearing under sustenance has degenerated into "government stroke" on day wages, virtually unchecked by fear of dismissal; that groups have been placed on unsuitable lands; that as yet no group has been completely disbanded; that

31 per cent of the migrants and 41 per cent of the Australians have left their holdings; that costs have been excessive; and that under a new agreement between the three Governments, applicable retrospectively, Western Australia can now charge the settler more than £1,000, together with interest.

The rural industries of England and Wales.—IV, Wales, A. M. Jones (*Oxford: Clarendon Press, 1927, vol. 4, pp. [XII]+123, pls. 9*).—This volume of the series previously noted (E. S. R., 57, p. 484) discusses the rural industries of Wales.

Agriculture and food supply in France during the war (*New Haven: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1927, pp. XIX+328+20, figs. 3*).—This publication of the translated and abridged series of the Carnegie Endowment for International Peace on the Economic and Social History of the World War includes two monographs as follows:

Agriculture in France during the war, M. Augé-Laribé (pp. 1–154).—This describes and discusses the conditions of French agriculture from 1900 to 1914; the conditions of agricultural production during the war, including a discussion of the crops from 1914 to 1918, the labor supply and mobilization of agricultural labor, the invaded areas, and technical difficulties of production and the legislative and administrative action taken; and the consequences of the war.

Food supply in France during the war, P. Pinot (pp. 155–311).—Part 1, on measures designed to meet the essential requirements of the consumer, discusses the control exercised by the Government over various commodities and industries. Part 2, on price control and efforts to reduce cost of living, discusses the laws pertaining to price control and the control exercised by the Government over the prices of various commodities.

Report of the Federal Trade Commission on the grain trade, VI–VII, H. Thompson, J. F. Nugent, et al. (*Washington: Govt., 1924, vol. 6, pp. XXII+374, pls. 6, figs. 13; 1926, vol. 7, pp. XXIV+419, pls. 24, figs. 8*).—These two reports cover part of the investigation previously noted (E. S. R., 53, p. 191).

Volume 6. *Prices of grain and grain futures.*—This volume analyzes the prices of grain, both cash and future, and the statistics of grain production and trade to determine the effects of the conditions and practices prevailing in the grain trade on the relations of year to year price changes to crops and other supply factors, the extent and causes of price changes within the crop year, the relative importance of different grain markets in recording or influencing price changes, the mutual influences of changes in cash and future prices, the differences between such prices and various conditions and the causes thereof, the degree to which the futures market is efficient in forecasting prices, the comparative steadiness of prices for commodities in which there is future trading, and other matters of interest to the grain trade and to the public. Most of the topics discussed are related to hedging and the efficient functioning of the futures market in that respect.

It was found (1) that generally there is an annual cycle in grain prices, the lower prices being in the fall and the higher prices in the spring. (2) The critical time in the readjustment of prices for all grains is general in July. (3) There is no convincing evidence that future trading has a stabilizing influence on prices, as future prices are no more stable than cash prices and the technical conditions of future trading cause some fluctuations which would not occur without future trading. (4) Based upon priority of price changes from day to day, futures lead at Chicago and Minneapolis for wheat, and cash prices for corn and oats, while at Kansas City and other markets cash prices lead for all three grains. (5) Under conditions prevailing in recent years, the futures

market through hedging has not been an efficient means of price insurance. (6) There is a definite tendency for the future price in the earlier months of trading to understate the ultimate price, thus making the risk of hedge sales considerable. One hundred and sixty-nine tables and 26 appendixes are included.

Volume 7. *Effects of future trading*.—This volume, the final one of the report, deals with the uses and abuses and the direct and incidental effects of future trading in grain. Speculation, hedging, scalping and spreading, volume of future trading, results for classes of trades and traders, services and costs of future trading, and manipulated and artificial prices are discussed, and conclusions reached and recommendations made by the commission as to grain exchanges, the relation of futures to the grain trade, further developments of exchange rules, the promotion of stability of prices, the responsibility of the broker, and other problems. One hundred and eighteen tables and 18 appendixes are included.

The principal contributions of this volume to the knowledge of the effects of future trading "relate to clearer distinctions regarding the nature of speculation, characteristics and difficulties of hedging practice, extent and methods of scalping, shares of speculative and other elements in future trading, extent of long and short 'open interests,' average gains and losses per bushel on trades, length of time that trades are kept open, occupations of traders, manipulative and other influences tending to artificial prices, etc."

A statistical examination of factors related to lamb prices, M. EZEKIEL (*Jour. Polit. Econ., 35 (1927), No. 2, pp. 233–260, figs. 2*).—A formula is derived, the index of multiple correlation for which shows that 96.4 per cent of the variation in the price per 100 lbs. of round dressed lamb (not deflated) from 1907 to 1925 can be explained in terms of the mathematical relation to the following factors: Months of year, beginning with January, 1907; dressed lamb per capita per month of 30.4 days; hog prices divided by Bureau of Labor Index of Wholesale Prices of all commodities; steer prices divided by Bureau of Labor Index of Wholesale Prices; veal prices divided by Bureau of Labor Index of Wholesale Prices; Harvard Price Index of Business Cycles divided by Bureau of Labor Index of Wholesale Prices; Snyder's Index of General Price Level; and months of the year, from 1 to 12.

The apparent importance of the several factors in per cent determination were long-time trend —0.3, lamb slaughter +29.9, hog prices —0.2, steer prices —3.1, veal prices —1.4, business activity +0.7, and general price level +68.3.

The net changes in lamb prices, due to a 5 per cent increase in the following independent variables, with other factors in each case held constant, were price of hogs +0.43, price of steers +1.60, price of veals +0.32, supply of lamb —3.19, price index of business cycles +0.48, and index of general price level +4.00. A slightly less than proportional change was obtained for 10 and 15 per cent increases.

Marketing Kentucky livestock, E. C. JOHNSON (*Kentucky Sta. Bul. 278 (1927), pp. 41–102, figs. 12*).—The methods used in Kentucky in marketing livestock are described and analyzed. The estimated average margins per hundredweight charged by 25 dealers in the Louisville territory were $2.12 for lambs, 81 cts. for hogs, and 72 cts. for cattle. The various items of cost of marketing are discussed, and suggestions offered for reducing marketing costs and improving practices.

The little town, especially in its rural relationships, H. P. DOUGLASS (*New York: Macmillan Co., 1927, new ed., pp. [XIII]+262, pls. 12, figs. 2*).—This is a limitedly revised edition of the book previously noted (E. S. R., 40, p. 892).

Rural organizations in relation to rural life in Virginia, W. E. GARNETT (*Virginia Sta. Bul. 256 (1927), pp. 110, figs. 20*).—This bulletin, the work of which was done in cooperation with the U. S. D. A. Bureau of Agricultural Economics, is the first of a series and gives special attention to the attitudes of farmers toward organizational questions. It is also intended to serve as a general introduction to the prevailing organizational situation and the questions involved. The data were obtained by schedules and personal interviews, over 1,000 persons in approximately 75 communities in 40 counties being interviewed. The prevailing organizational situation in rural Virginia, commodity associations, general type farm organizations, educational associations, and the organizational activities of public service agencies and institutions are described; the conditions appearing to demand organized effort are analyzed; and the significance and causes of the prevailing attitudes toward rural organizations are discussed. A case study is made of the Tobacco Growers' Association.

The survey led to the conclusion that organizational activity in Virginia is greater than generally realized and is on the increase, but that as yet a comparatively small percentage of the people are taking any part. Publicly-supported institutions with paid workers are playing a greater and greater part in the situation. There are no farmers' organizations in the State strong enough to adequately deal with State-wide questions, and team pull between the different types of organizations is insufficient. Public opinion-forming agencies are not properly supporting rural organizations, and the educational system of the State has not given and is not giving the country people sufficient education to prepare them for successful organizational effort. Lack of more general support of organizational effort appears to be due to the failure to realize the importance of the problems needing group effort, the lack of understanding as to the best methods of procedure, the failure of the people and of their leaders to acquaint themselves with available information on organizational questions and policies and of leaders to make the best use of measures to overcome adverse attitudes, the lost motion in organizational effort and failure to reach objectives, the general prevalence of certain deep underlying attitudes, and the fact that a long-established system, often involving large interests, is being replaced.

[Agricultural statistics for Canada] (*Canada Yearbook, 1926, pp. 116–123, 191–266, figs. 2*).—Statistical tables are included for rural and urban population; agricultural revenue and wealth; acreage, yield, quality, and value of field crops; livestock and poultry; fur farming; dairying; fruit farming; special agricultural crops; farm labor and wages; prices of agricultural products; farm population, farm holdings, areas and tenure; irrigation; and international agricultural statistics.

FOODS—HUMAN NUTRITION

The chemical technology of foods and condiments, R. STROHECKER (*Chemische Technologie der Nahrungs- und Genussmittel. Leipzig: Otto Spamer, 1926, pp. XI+252, figs. 86*).—This is a general account of the processes of preparing, preserving, and marketing animal and vegetable foods, whether sold in the fresh condition or preserved by bottling, canning, etc. The subjects include meat and related products, eggs, milk, cheese, edible fats, cereal products, bakery products, baking powders, sago, starch, sugar and related products, cacao products, tea and tea substitutes, coffee and coffee substitutes and other beverages, vinegar, and spices and condiments.

The examination of spoiled canned foods.—2, Classification of flat sour, spoilage organisms from nonacid foods, E. J. Cameron and J. R. Esty (*Jour. Infect. Diseases, 39 (1926), No. 2, pp. 89–105, figs. 6*).—From 5,594 cans representing 439 samples of spoiled and sound nonacid products submitted to the research laboratory of the National Canners Association 214 cultures of nongas-forming spore-forming bacteria were isolated and studied by the methods outlined in the first paper of the series (E. S. R., 55, p. 111) to determine types significant in the production of flat sour spoilage.

"Two large thermophilic groups were defined as causing this type of spoilage. Group 80, a facultative thermophilic group, comprised 51 cultures and had been isolated from pure cultures in corn, peas, string beans, baked beans, Lima beans, spinach, milk, pumpkins, hominy, and potatoes; and from mixed cultures in beets. Group 100, an obligative thermophilic group, comprised 42 cultures and had been isolated from pure cultures in corn, hominy, milk, peas, pumpkin, and string beans. Upon reinoculation, it was found that group 80 produced the typical flat sour condition in corn, peas, hominy, potatoes, Lima beans, baked beans, string beans, spinach, beets, pumpkin, milk, broccoli, and asparagus. Group 100 produced flat sours in corn, peas, and broccoli and by virtue of starch-splitting enzymes, sweetness in hominy. Certain strains could sour evaporated milk and string beans."

The effect of desiccation upon the nutritive properties of egg-white, M. A. Boas (*Biochem. Jour., 21 (1927), No. 3, pp. 712–724, pl. 1, figs. 4*).—A further investigation of the cause of the nutritive failure of dried egg white as a source of protein in basal rations for rats (E. S. R., 53, p. 162) is reported. Although no definite conclusions are drawn, the author appears to be of the opinion that egg white dried without previous coagulation by boiling is lacking in some dietary constituent which is present in raw potato, potato starch, arrowroot, dried yeast, fresh egg white, egg yolk, milk, commercial casein, crude lactalbumin, spinach and cabbage leaves, banana, and dried horse serum. This hypothetical factor X, although having a similar distribution to vitamin B, is apparently not identical with either of the factors composing vitamin B.

The effect of halogen salts on peptic digestion, W. M. Clifford (*Biochem. Jour., 21 (1927), No. 3, pp. 544–548, fig. 1*).—In continuation of the investigation previously noted (E. S. R., 53, p. 761), the effect of halogen salts on peptic digestion was studied by noting the time required for clotting a definite amount of milk by a pepsin solution of known concentration in the presence of salt. The standard for comparison was so adjusted that under the condition of the experiment 10 cc. of milk, 2 cc. of water, and 2 cc. of pepsin solution clotted in from 1½ to 3 minutes.

The clotting was hastened by the chlorides and bromides of sodium, potassium, and ammonium, the ammonium salts having the strongest effect, and retarded by the corresponding iodides and fluorides, the ammonium salts having the weakest action. Both the acceleration and retardation were functions of the concentration. Magnesium, calcium, and barium halides increased the rate of coagulation of milk by pepsin.

pH concentration of intestinal contents of dog, with special reference to inorganic metabolism, D. M. Grayzel and E. G. Miller, Jr. (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 7, pp. 668–670*).—In this preliminary report data are summarized on the pH concentration, determined in most cases colorimetrically, of sections of the gastrointestinal tract of dogs on normal, high carbohydrate, high fat, and high protein diets and on a rachitic diet and the same diet supplemented by cod-liver oil and by irradiation.

The entire intestinal tract showed acidity on all of the diets except the rickets-producing diet, which caused a definite rise in pH in the intestines

even to alkalinity. Ultra-violet irradiation, cod-liver oil administration, and the addition of calcium lactate or calcium phosphate to the rickets-producing diet gave normal values for the intestinal contents.

The pH of the gastro-intestinal tract of certain rodents used in feeding experiments, and its possible significance in rickets, T. Redman, S. G. Willimott, and F. Wokes (*Biochem. Jour., 21 (1927), No. 3, pp. 589–605, figs. 5*).—This investigation was undertaken to determine whether the altered reaction of the feces of rats on a rachitic diet noted by Zucker and Matzner (E. S. R., 51, p. 464) and confirmed by Jephcott and Bacharach (E. S. R., 56, p. 412) is also true of the portions of the gastrointestinal tract where calcium and phosphorus are absorbed. A study was first made on guinea pigs and rats of the sources of error in various methods of determining the pH of portions of the gastrointestinal tract, and a satisfactory electrometric technique was developed involving the use of a capillary electrode vessel and quinhydrone electrode.

The average pH values obtained for guinea pigs and adult rats, respectively, were stomach 3.8 and 4, duodenum 5.1 and 5.5, jejunum 6.1 and 6, ileum 7.4 and 6.8, cecum and large intestine 6.4 and 6.5. In rats from one to three months old the average figures were jejunum 6.8, ileum 7, and cecum and large intestine 6.7.

In the tests on rats on rachitic diets, two types of diet were used, the high fat type of Chick and Roscoe (E. S. R., 55, p. 891) and the low fat type represented by the Sherman-Pappenheimer diet 84. The former diet, when supplemented by vitamin D, gave a more highly acid reaction than normal throughout the gastrointestinal tract, but in the absence of vitamin D the fecal reaction became alkaline. The low fat rachitic diet brought about an alkaline reaction throughout the intestinal tract, but especially in the cecum and large intestine, where absorption and retention of calcium are most likely to take place. Administration of vitamin D restored the acidity. The addition to the rachitic diet of a well buffered natural food in the form of orange juice had no effect on the fecal reaction until vitamin D had been added.

These results are thought to furnish satisfactory proof that the pH of the feces is a reliable indication of the reactions in the cecum and large intestine, and to suggest that vitamin D acts in the absorption of calcium and phosphorus through its effect upon the H-ion concentration of the intestinal tract.

Feeding experiments with plants at different stages of development.—III, Synthesis of vitamin in plants, M. Karshan, F. Krasnow, and B. Harrow (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 8, pp. 765, 766*).—In this continuation of the study previously noted (E. S. R., 53, p. 766), ungerminated, germinated, and green corn were compared as to content of vitamin A by using an equal number of seeds instead of equal weights of the three materials.

One group of five rats whose weight had become stationary on a diet deficient in vitamin A was given six seeds of ungerminated corn per rat per day in addition to the basal diet, another group of five received the equivalent of six seeds of germinated corn, and a third group the green seedlings. Within 81 days all of the rats in the first two groups had contracted xerophthalmia and eight had died, while all of the rats in the third group were in excellent condition and were gaining in weight. This is thought to indicate a synthesis of vitamin A during the development of the green color.

On the composite nature of the water-soluble B vitamin, H. Chick and M. H. Roscoe (*Biochem. Jour., 21 (1927), No. 3, pp. 698–711, figs. 2*).—The authors have added to the rapidly accumulating evidence of at least two factors in what has been known as vitamin B by a series of experiments in

which various extracts and preparations of yeast and of wheat embryo were used singly and combined as the source of vitamin B in preventive and curative tests on rats. Brewers' yeast was shown to be a rich source of both factors and pure wheat embryo rich in the antineuritic but poor in the heat-stable factor.

A preparation practically free from the antineuritic but rich in the heat-stable factor was obtained by heating dried yeast in an autoclave at 120° C. for 5 hours. An extract of yeast prepared by Peters' method of concentrating the antineuritic vitamin (E. S. R., 52, p. 462) was found to be practically devoid of the heat-stable factor. In some but not all of the rats receiving the antineuritic but not the heat-stable factor, a pellagrous condition similar to that described by Goldberger et al. (E. S. R., 55, p. 890) and by Salmon (E. S. R., 57, p. 594) developed. The principal differences in properties of the two constituents of vitamin B are summarized as different solubilities in strong alcohol, benzene, and acetone, differing capacities of adsorption on various finely divided solids, and a markedly different resistance to heat. The antineuritic vitamin has the greater solubility and capacity of adsorption and the lower resistance to heat.

Chemical studies of vitamin-B in Japan, U. Suzuki (*Inst. Phys. and Chem. Research [Tokyo] Sci. Papers, 4 (1926), No. 63, pp. 295–301*).—In this lecture, delivered at the Sixth Congress of the Far Eastern Association of Tropical Medicine at Tokyo on October 12, 1925, the author reviews briefly the studies which have been conducted in his laboratory since 1910 on the isolation and chemical constitution of vitamin B. The original reports of some of these studies are available only in Japanese publications.

The antiscorbutic fraction of lemon juice, V, S. S. Zilva (*Biochem. Jour., 21 (1927), No. 3, pp. 689–697*).—In this continuation of the author's attempts to determine the chemical nature of vitamin C (E. S. R., 57, p. 488), a comparison was made of the reducing capacity of antiscorbutic solutions from lemon juice as measured by the reduction of phenolindophenol with their potency in vitamin C.

That the two are not directly associated was demonstrated by the fact that inactive fractions derived by precipitating decitrated lemon juice with neutral lead acetate at pH 5.4 showed greater reducing properties than the active fraction from the same source, and that the reducing capacity could be fully destroyed by the addition of phenolindophenol in excess without immediately impairing the antiscorbutic activity.

Both the reducing and the atiscorbutic properties were destroyed in alkaline medium in the presence of air, by aeration, and by storage. On heating decitrated lemon juice in a neutral or acid medium in an autoclave at a pressure of one atmosphere for one hour, no appreciable destruction of the antiscorbutic activity or the reducing capacity of the solution took place, but on storing both of these functions deteriorated much more quickly than in untreated decitrated lemon juice. "It is suggested that the stability of the antiscorbutic factor possibly depends on a chain of reactions, which are kept in equilibrium in the living cell."

The vitamin content of Tinct. Limonis Fort., B. P. C., S. G. Willimott and F. Wokes (*Pharm. Jour. and Pharm. [London], 4. ser., 63 (1926), No. 3275 pp. 184–186, fig. 1*).—A summary of studies on the vitamin content of an alcoholic tincture of lemon rind, flavedo. More detailed reports have been noted of the studies dealing with vitamin B (E. S. R., 55, p. 593) and vitamin C (E. S. R., 56, p. 696), as well as a preliminary general report (E. S. R., 57, p. 489) The lemon rind was found to be rich in vitamin B but to contain very littl vitamin C or vitamin A.

Note on different extracts of yeast and their content of vitamin D [bios] related to the initial proportion of fresh yeast used for their preparation [trans. title], C. FUNK and R. LECOQ (*Compt. Rend. Soc. Biol. [Paris], 97 (1927), No. 23, pp. 440–442*).—To determine the possible relation of the yeast stimulant bios to the two factors now recognized as together composing vitamin B, the authors have determined by the method of Funk and Dubin (E. S. R., 44, p 861) the relative amounts of bios in an alcoholic extract of distillery yeast, an alcoholic extract of brewery yeast, an alcoholic extract of brewery yeast autoclaved in an alkaline medium at 130° C., and Harris yeast extract. The amounts taken of each of the materials were such as to correspond to 25 gm. of the original yeast.

According to the data reported, the various preparations showed the same activity as the source of bios. This would appear to indicate that the proportion of bios is related neither to the antineuritic vitamin nor the heat-stable factor (vitamins F and G).

Experiments upon the quantitative differentiation of vitamins A and D, M. C. HESSLER (*Diss., Columbia Univ., New York, 1926, pp. 40, fig. 1*).—Essentially noted from another source (E. S. R., 57, p. 293).

The fat-soluble vitamin content of hen's egg yolk as affected by the ration and management of the layers, R. M. BETHKE, D. C. KENNARD, and H. L. SASSAMAN (*Jour. Biol. Chem., 72 (1927), No. 2, pp. 695–706, figs. 2*).—In this paper, based on work previously noted (E. S. R., 57, p. 174), it is suggested that in view of the marked variations reported in the content of vitamins A and D in eggs, depending upon the ration and environment of the hens, an additional price qualification, their vitamin content, as determined largely on this basis, may be required for the highest class of eggs in the near future. "Even in the light of present information it would not be unreasonable to secure eggs for use in hospitals and for infants from flocks receiving an adequate ration and having access to a suitable outdoor range or its equivalent throughout the year."

A new dietary deficiency with highly purified diets, H. M. EVANS and G. O. BURR (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 8, pp. 740–743*).—A new highly purified basal diet for vitamin E experiments is described, with preliminary data on its use. The diet consists of casein prepared by the Van Slyke method 50, sucrose crystallized from 80 per cent alcohol 150, and a salt mixture (185) 8 parts, with distilled water ad libitum containing potassium iodide, cod-liver oil from 2 to 3 drops daily, and yeast from 700 to 1,000 mg. daily.

When rats are placed on this diet at the age of 21 days, the females are said to grow slowly to a weight of about 125 gm. and to remain at this weight. Ovulation does not begin until after the first 4 months instead of before the fiftieth day under normal conditions. Males grow at a more normal rate for about 18 days, reaching a weight of about 100 gm. and then ceasing to gain. On 750 mg. of fresh wheat germ daily instead of yeast, the same weight is reached but much more slowly. Females receiving 600 mg. of fresh wheat germ daily instead of the yeast cease to grow at about 100 gm. The pure diet supplemented by 10 gm. of fresh lettuce or 0.5 gm. of fresh beef liver is said to support normal growth, gestation, and the birth of good litters, but to be deficient for lactation. The diet is thought to furnish sufficient vitamins A and D, and, when wheat germ is used, E, and the authors are inclined to believe that a deficiency in B is not involved.

Irradiated protein-free milk fat: An active, pleasant tasting antirachitic agent [trans. title], F. ROHR and O. SCHULTZ (*Klin. Wchnschr., 6 (1927), No. 18, pp. 848–853, figs. 4*).—Butterfat which has been carefully freed

from protein is said not to acquire on irradiation the unpleasant odor and taste which make many irradiated substances as objectionable as cod-liver oil. Data are reported on an extensive series of feeding experiments, both curative and preventive, on rats, and on the treatment of rachitic children, using this fat as the antirachitic agent. Experimental rickets in rats was practically cured in 9 days and completely in 20 with a daily dose of 0.1 gm. of the irradiated milk fat. In the treatment of infantile rickets equally good results were obtained. The fat was fed in amounts of 15, 30, and 60 gm. daily, but the smallest amount proved sufficient.

Inorganic blood phosphate of rats on rachitic and non-rachitic diets, E. M. Koch and M. H. Cahan (*Soc. Expt. Biol. and Med. Proc., 24 (1926), No. 2, pp. 153, 154*).—In an attempt to determine the value of inorganic blood phosphate as an early diagnostic symptom of rickets, blood phosphate values were obtained for rats of different ages on normal and rachitic diets and rachitic diets supplemented in various ways.

"The results of this study indicate that while cod-liver oil raises the inorganic blood phosphate almost to normal, direct irradiation of, and feeding irradiated cholesterol to, young rats had very little effect on blood phosphate. It is possible to obtain low phosphate values and a low product of (P) × (Ca) in animals which, so far as Röntgenograms can demonstrate, show a perfect calcification of the bones. The inorganic blood phosphate is influenced by many factors aside from the rachitic condition, many of which we can not explain at present."

***Antirachitic activity of irradiated cholesterol, ergosterol, and allied* substances,** A. F. Hess (*Jour. Amer. Med. Assoc., 89 (1927), No. 5, pp. 337–339*).—This is a brief review of the literature on the activation of various materials by irradiation, with data on the antirachitic action of irradiated brains and irradiated dried yeast. Both proved exceedingly active in rat tests and have also proved effective in the treatment of infantile rickets. In the latter irradiated dried brains were fed in 1-gm. daily doses and irradiated yeast in 0.5- to 1-gm. daily doses suspended in milk. The irradiated yeast not only brought about definite cures, but in some cases increases in weight.

The optical detection of a vitamin [trans. title], R. Pohl (*Naturwissenschaften, 15 (1927), No. 20, pp. 433–438, figs. 9*).—A brief report of the optical studies in the cooperative investigations of Windaus (E. S. R., 57, p. 197), Hess (see above), Rosenheim and Webster (E. S. R., 57, p. 492), and the author, as the result of which the identity of ergosterol with the precursor of vitamin D was established.

The antirachitic activity of monochromatic and regional ultraviolet radiations, A. F. Hess and M. Weinstock (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 8, pp. 759, 760*).—By irradiating cholesterol with monochromatic rays in the region of greatest activity, it was found that the 302μμ line has marked potency in rendering cholesterol antirachitic, while the 313μμ line is of little effect. Radiations less than 290μμ in length (the shortest emitted by the sun) were isolated from a mercury vapor lamp and found to produce a more intense antirachitic effect than the most potent region of the solar spectrum.

Ultraviolet radiation from sunlight and incandescent lamps: Its transmission through window glass and substitutes, H. N. Bundesen, H. B. Lemon, I. S. Falk, and E. N. Coade (*Jour. Amer. Med. Assoc., 89 (1927), No. 3, pp. 187–189, figs. 6*).—From calibrated photographs of the solar spectrum taken daily, it has been possible to determine variations in the limits of the solar spectrum at different times of the year. Readings of such photographs taken in Chicago between November 28, 1926, and May 16, 1927, show that compari

tively little ultra-violet radiation of known physiological value (3,200 to 2,900 angstrom units) appears in the solar spectrum during the winter months in that city. Under the most favorable conditions the last detectable lines were 3,100 to 3,050 angstrom units in November, December, and January. From February to April the limits were in the region 3,040 to 3,000 and in May as low as 2,990. On smoky days the spectrum rarely showed an intensity below 3,100 angstrom units.

Photographs of the spectra of radiations from various artificial sources and of sunlight through different filters are also given. Incandescent 300-watt lamps with ordinary glass bulbs emitted radiations comparable to sunlight in the winter months and Vitaglass bulbs radiations as far as the region of 2,800 to 2,900 angstrom units. Sunlight spectra through Vitaglass and a sample of M. G. Co. glass were practically the same, both glasses transmitting the sunlight available at the time to 3,000 angstrom units.

Notes on treatment of nursing mothers with ultra-violet rays, C. Chisholm and M. McKillop (*Lancet [London], 1927, II, No. 5, p. 227*).—Systematic irradiation of mothers whose breast milk had been failing was found to be of general benefit in all of the 53 cases in which the treatment was continued for some time and of aid in improving or retaining the milk supply in all but 11 of these cases.

The effect of ultraviolet radiation on resistance to infection, C. McD. Hill and J. H. Clark (*Amer. Jour. Hyg., 7 (1927), No. 4, pp. 448–462, figs. 2*).—A systematic investigation of the effect of ultra-violet radiation on the resistance of albino rats to a pneumococcus infection is reported, with results which are in accord with the conclusions of Barenberg, Friedman, and Green (E. S. R., 56, p. 91) that ultra-violet radiation is not in general able to increase the resistance of the body to infection.

In three separate series of experiments there was no change in the erythrocyte or leucocyte counts in the blood of rats irradiated daily. The platelets showed a consistent increase, but there was no correlation between a high platelet count and subsequent resistance to a general infection with Pneumococcus I. "We conclude, therefore, that the present state of our knowledge concerning the effect of ultra-violet radiation on susceptibility to infection does not justify its use as a general therapeutic agent in infectious diseases, and gives very little support to the belief that it is capable of increasing natural resistance in normal individuals."

Effect of high voltage cathode rays on rickets and on the activation of cholesterol, A. Knudson and W. D. Coolidge (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 4, pp. 366–369*).—Cathode rays with voltages of 100, 200, and 350 thousand, although rendering cholesterol antirachitic after very brief exposure, did not cure rickets in rats by direct exposure. "The fact that the direct exposure of rats to cathode rays has not been found to cure rickets is presumably to be explained by the fact that, owing to severe damage done to the animal by the treatment, it is not possible to give the dose which would be required to activate enough of the cholesterol of the skin to bring about the desired result."

The antirachitic effect of December sunlight: Seasonal variation, F. F. Tisdall and A. Brown (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 5, pp. 446–449*).—As a part of a study of variations in the ultra-violet content and antirachitic factor of the sun's rays throughout the year at Toronto, groups of albino rats from the same stock, 25 to 27 days old and weighing about 40 gm. at the beginning of the experiment, were placed each week on a rickets-producing diet (McCollum's diet 3143) and exposed in the open air to sunlight for periods of from 15 minutes to 2 hours daily. Control rats were kept inside

in an ordinary well-lighted room on the same diet, while others on a normal diet were exposed to the same conditions of sunlight and absence of sunlight. After varying periods up to 4 weeks, 2 rats from each cage were killed and examined for rickets by X-ray and by determinations of the inorganic phosphorus of the blood and the ash content of the bones.

The data reported for the month of December, 1926, indicate a definite antirachitic effect, although not complete protection, afforded by the winter sunshine. Meteorological records for the same period showed that the average daily sunshine during the hours in which the rats were exposed was only 36 minutes.

The antirachitic effect of December skylight and of December sunlight through Vitaglass, F. F. Tisdall and A. Brown (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 5, pp. 449–451*).—A comparison was made by the same methods as in the study noted above of the antirachitic effect of December skylight with sunlight and of sunlight through Vitaglass with the same sunlight through ordinary glass.

Rats exposed to skylight but shielded from direct sunlight showed almost as great a protection from rickets as those exposed to the available sunlight. Sunlight passing through Vitaglass had about one-fourth the antirachitic effect of direct rays, but after passing through ordinary window glass was without appreciable antirachitic effect.

The development of marked activity in ergosterol following ultra-violet irradiation, A. F. Hess and A. Windaus (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 5, pp. 461, 462*).—A brief note to the effect that irradiated ergosterol is capable of inducing healing of rickets in rats in doses as small as 0.003 mg. per capita per day.

An attempt at an ergosterol balance [trans. title], H. Beumer (*Klin. Wchnschr., 6 (1927), No. 20, pp. 941, 942*).—The method of determining the ergosterol balance in the experiments described consisted in feeding a baby 300 gm. of skimmed human milk with 10 cc. of olive oil daily for preliminary and after periods of 4 days each and the same mixture to which 0.4 gm. of ergosterol had been added during the experimental period proper of 4 days. The marked feces for the different periods were extracted with alcohol and the extracts divided into two equal parts, one of which was precipitated directly with digitonin and the other after irradiation for one hour at a distance of 20 cm. The difference in the precipitates of the two portions was considered to represent the ergosterol.

Of the total amount of 400 mg. of ergosterol fed, only 147 mg. was recovered in the feces. In attempting to explain this, the author suggests the probability that the excess had been stored in the body and that if this be the case it might be possible to increase the antirachitic effect of sunlight by feeding ergosterol. In this connection, attention is called to an experiment in which the cholesterol content of fish was greatly increased by feeding egg yolk.

A note on the weight of the rat during gestation, G. A. Hartwell (*Biochem. Jour., 21 (1927), No. 3, pp. 572–575*).—The weights of female rats immediately after the birth of young compared with the weights 23 days earlier, or at the beginning of gestation, showed gains during gestation in 364 out of 403 cases. The diets on which the rats were maintained were those used by the author in her various nutrition studies and were in many cases deficient in one respect or another. It is concluded that "the characteristic sacrificing of the mother for her offspring, a noticeable feature of the lactation period, does not occur during gestation. The low weight of the young at birth, and the fact that many are frequently born dead when the mother is given a poor diet, may also be regarded as evidence in favor of this statement."

Blood regeneration in severe anemia, VIII, IX (*Amer. Jour. Physiol., 80 (1927), No. 2, pp. 391–410*).—In continuation of the series of studies previously noted (E. S. R., 56, p. 494) two papers are presented.

VIII. *Influence of bone marrow, spleen, brains, and pancreas feeding.—The question of organic iron in the diet*, G. H. Whipple and F. S. Robscheit-Robbins (pp. 391–399).—With the use of the same methods as in the previous studies of the series, hemoglobin production to an extent of from 20 to 50 gm. above that produced by the standard bread diet alone in a 2-week period required from 150 to 300 gm. daily of cooked spleen, from 30 to 40 gm. of bone marrow powder, or from 200 to 300 gm. of cooked brains. An average increase of 35 gm. resulted from 200 to 300 gm. of pancreas. None of the materials proved as satisfactory for hemoglobin regeneration as liver or kidney. Attention is called to the lack of parallelism between the iron content of meat products and their capacity to promote hemoglobin regeneration under controlled conditions.

IX. *Influence of fresh and dried fruits*, F. S. Robscheit-Robbins and G. H. Whipple (pp. 400–410).—The addition of 200 gm. of cooked apricots or peaches caused an average output of from 40 to 45 gm. of hemoglobin in 2 weeks over and above the standard control. This places peaches and apricots in the same class with certain meat products and in a higher class than all dairy products for hemoglobin regeneration in simple anemia. Prunes were about as effective as apricots and peaches, and raisins and fresh grapes somewhat less favorable (from 150 to 300 gm. producing from 20 to 30 gm. hemoglobin in 2 weeks). Apples, fresh and dried, although variable, averaged about the same as grapes and raisins, and fresh black raspberries were practically inert.

TEXTILES AND CLOTHING

Mechanical and physical technical textile investigation, P. Heermann (*Mechanisch- und Physikalisch-Technische Textiluntersuchungen. Berlin: Julius Springer, 1923, 2. ed., rev., pp. VIII+270, figs. 175*).—This technical manual outlines the experimental technique involved in technical studies of the microscopy of fibers, humidity relations, yarn numeration, the physical and textile qualities of fibers, yarns, and fabrics, and the reaction of textiles to various processes and enviromental factors. The required apparatus is described and illustrated, and typical examples are given, with discussion of the interpretation of test results.

Summary of an investigation on the fastness of color of fabrics guaranteed fast to water and light (*Natl. Assoc. Dyers and Cleaners Rev., 4 (1927), No. 8, pp. 26, 27*).—According to the results of a study of fastness to laundering and daylight reported by J. V. Coles from the University of Missouri, guaranteed fabrics were generally found to be decidedly more reliable than nonguaranteed and branded fabrics slightly more reliable than nonbranded. Because of the wide variation in the reliability of fabrics the consumer can not yet depend upon the guarantee but should apply the simple household test outlined. Most fabrics showed a close correlation between fastness to laundering and to light, although some varied widely in this respect. Colors differed widely as to their fastness to laundering and to light. Yellow quite consistently showed the greater degree of fastness. Pink was more fast to laundering than to light, whereas blue, yellow, lavender, and green were more fast to light than to laundering. Pink and blue quite generally showed the same degree of fastness. Lavender and green seemed less fast than the other three colors, and green was consistently the least fast.

Pulping flax straw, E. R. Schafer, M. W. Bray, and C. E. Peterson (*Pulp and Paper Mag. Canada, 25 (1927), No. 7, pp. 209–212, figs. 3*).—This further study (E. S. R., 56, p. 698) dealt with the quantities of chlorine required to complete pulping of flax straw digested with various quantities of caustic soda. Under a wide range of conditions in regard to the quantities of chemicals and the duration of the cooking periods, there appeared to be a linear decrease in the amount of chlorine consumed as the caustic soda consumption increased. Chemical analysis of the pulps showed an increase in the purity of the soda pulp as the quantity of the chemical and time of digestion were increased. The higher degrees of purity were accompanied, however, by greater losses of cellulose. Chlorination was found to increase the purity of the pulp, as evidenced not only by an increase in the cellulose and a decrease in the lignin content, but also by a reduction of the copper number and of the solubility in 1 per cent caustic soda solution.

MISCELLANEOUS

Work and progress of the [Idaho] Agricultural Experiment Station for the year ended December 31, 1926, [E. J. Iddings] (*Idaho Sta. Bul. 149 (1927), pp. 52*).—This contains the organization list, a report of the director, and financial statements for the Federal funds for the fiscal year ended June 30, 1926, and for the remaining funds for the fiscal year ended December 31, 1926. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

The Thirty-ninth Annual Report of the Maryland Agricultural Experiment Station, [1926], H. J. Patterson (*Maryland Sta. Rpt. 1926, pp. XVI+222, figs. 107*).—This contains the organization list, a report by the director on the work and publications of the station, a financial statement for the fiscal year ended June 30, 1926, and reprints of Bulletins 274–282, all of which have been previously noted.

Forty-seventh Annual Report of the New Jersey State Agricultural Experiment Station and the Thirty-ninth Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1926, J. G. Lipman et al. (*New Jersey Stas. Rpt. 1926, pp. XXIX+568, pls. 10, figs. 70*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, a report of the director on the work and publications of the year and departmental reports, the experimental features of which not previously reported are for the most part abstracted elsewhere in this issue. Meteorological observations by C. H. Steelman (pp. 300, 301) are included.

NOTES

Alabama College and Station.—Provision was made by the last legislature for five substations to be known as the Tennessee Valley, the Sand Mountain, the Black Belt, the Wire Grass, and the Gulf Coast Substations. Two of these substations are to be established prior to September 30, 1928, and the remainder during the following year. An appropriation of $25,000 was made for buildings and equipment for each substation and $12,000 each for maintenance and operation. The act requires the donation of not less than 200 acres of representative soil for each substation.

W. L. Blain, associate professor of plant pathology and associate plant pathologist, has resigned to become head of the department of biology of Southeastern State Teachers College of Durant, Okla. W. E. Sewell, assistant professor of animal industry, has been given a year's leave of absence for graduate work. W. C. Taylor and L. H. Stinnett have been appointed instructors in animal husbandry, and S. L. Worley, research assistant in agronomy. O. C. Medlock has succeeded L. M. Ware as assistant professor of horticulture.

Miss Louise Phillips Glanton has been appointed head of the home economics department, beginning September 1. Drs. N. B. Guerrant and I. M. Hays have been added to the station staff, the former for work in nutritional chemistry and the latter to study changes caused in the animal body by food deficiencies.

California University and Station.—E. O. Essig, associate professor of entomology and associate entomologist, has been appointed professor of entomology and entomologist. Dr. Edwin C. Van Dyke, associate professor of entomology, has been appointed professor of entomology.

Dr. H. D. Chapman, assistant in soils in the Wisconsin University and Station, has been appointed assistant chemist in the Citrus Station at Riverside, effective October 15.

Idaho University and Station.—Raymond T. Parkhurst, head of the poultry department, has been appointed director of the National Institute of Poultry Husbandry at the Harper Adams Agricultural College of England, filling the vacancy existing since the resignation of Willard C. Thompson in 1926.

Iowa College and Station.—In addition to a new $500,000 dairy manufacturing building, four minor buildings are to be constructed this year for the use of the college and station. These buildings include an entomology building for the study of insects important in Iowa, a central feed barn and feed storage building equipped with grinding facilities, an agronomy building to be used for the storage of experimental crops and as a workshop for agronomy farm workmen, and a horticultural farm building for storing sweet corn and bulky garden crops such as squash and pumpkins.

Dean and Director C. F. Curtiss has returned from a summer in Europe, during which time he made a special study of the European corn borer in its native home. He found corn being grown successfully along the Danube River, even though the region is infested with the borer.

Dr. Laura I. McLaughlin, nutrition chemist of the U. S. D. A. Bureau of Home Economics, has been appointed director of research in foods and nutrition in the station.

Kansas College and Station.—The college library, built of local limestone at a cost of $250,000, has been completed. Additional milling equipment costing $12,000 is being installed in the college mill to provide improved facilities for investigations in milling technology. A project on tempering factors affecting the quantity and quality of wheat flour is to be started as soon as the equipment is installed.

The second annual hog feeders' day was held October 21. A report of experiments on the use of cottonseed meal as a substitute wholly or in part for tankage as a protein supplement in the feeding ration was made.

Dr. E. C. Miller, professor of botany and plant physiologist, has been placed in charge of the department of botany during the leave of absence of L. E. Melchers, recently noted. C. H. Ficke is to assist in plant pathology investigations.

Millard Peck, associate professor of agricultural economics and land economist, has resigned to accept a position in the U. S. D. A. Bureau of Agricultural Economics. He has been succeeded by Harold Howe, assistant professor of agricultural economics, and he in turn by Homer J. Henney. Dr. W. R. Hinshaw, instructor in bacteriology and assistant in poultry disease investigations, has resigned to become specialist under the poultry disease elimination law in the Massachusetts Station and has been succeeded by Dr. C. A. Brandly.

Charles R. Enlow, assistant professor of agronomy and assistant in cooperative experiments, has resigned to accept a position in the U. S. D. A. Bureau of Plant Industry and has been succeeded by C. O. Grandfield, formerly county agent of Bourbon County. W. J. Caulfield has been appointed instructor in dairy husbandry vice K. M. Renner, resigned to accept a teaching position in the Texas Technological College. Other recent appointments include L. R. Quinlan, assistant professor of horticulture in charge of landscape gardening; M. A. Alexander, instructor in animal husbandry; R. O. Pence, assistant in milling technological investigations; and Miss Leah Ascham, technician in home economics investigations.

Massachusetts College and Station.—S. B. Haskell, director of the station and acting head of the division of agriculture in the college, has tendered his resignation, effective December 15, to engage in commercial work. Henry Van Roekel has resigned as specialist under the poultry disease elimination law. Recent appointments include the following: Moses E. Snell as investigator in agronomy vice Robert S. Horne, resigned; F. P. Griffiths, investigator in horticultural manufactures; Dr. E. F. Sanders as assistant specialist and Miriam K. Clarke as analyst under the poultry disease elimination law, the latter in place of Mrs. Leila Prescott; and H. Robert De Rose as assistant official chemist and J. W. Kuzmeski as analyst in the feed and fertilizer control, the former vice L. S. Walker, whose resignation has been previously noted.

Nebraska University.—Dr. Samuel Avery retired as chancellor September 1 after nearly 20 years' service in that capacity. He will continue to carry on research in chemistry.

Vermont University and Station.—A special appropriation was made by the last legislature for the use of the dairy department to enable the operation of a dairy farm, the building up of a high-class dairy herd, and the giving of additional instruction in technical dairy subjects. Under the enlarged program two additional professorships have been established. M. H. Campbell, associate in dairy husbandry in the Illinois University and Station, has been appointed professor of dairy production and assistant animal husbandman, and he, in

addition to teaching dairy production courses, will have direct supervision of the herd and the dairy farm.

R. W. Smith, Jr., whose resignation as assistant professor of dairying at the Massachusetts College has been noted, has been appointed professor of dairy manufactures. Considerable new equipment, including a modern unit for processing market milk, is being installed on the farm and in the dairy laboratories, which will add materially to the efficiency of the work in both the regular and short courses.

W. B. Silcox, assistant professor of animal and dairy husbandry, has resigned to take up graduate work in milk marketing at the University of Wisconsin. J. M. Frayer has been appointed assistant dairy bacteriologist in the station.

A. W. Lohman, instructor in poultry husbandry at the University of New Hampshire, has accepted an appointment as assistant professor of poultry husbandry. He will have charge of all poultry instruction in the university, will install the new plant recently authorized, and will be available in poultry extension work.

Wisconsin University and Station.—A memorial was unveiled on the university campus October 13 in honor of Henry Krumrey, founder and in its early years the president of the Wisconsin Cheese Producers Federation. The memorial is in the form of a 7-ton granite boulder, on which a bronze tablet has been placed, and is the gift of a large number of friends of the federation. It is the third marker of the kind which has been located on the university campus, its predecessors being in honor of the late W. D. Hoard and Dr. W. A. Henry, emeritus professor of agriculture since 1907.

At the impressive unveiling exercises brief addresses were made by Dr. Theodore Macklin, professor of agricultural economics and agricultural economist, and U. S. Senator J. J. Blaine, together with a brief biographical sketch of Mr. Krumrey by J. H. A. Lacher. A replica of the tablet was unveiled on October 16 at Plymouth, the birthplace of the federation.

A series of from 30 to 35 three-day cooperative farmers' institutes will be held this winter throughout the State under the supervision of the College of Agriculture. These institutes were inaugurated two years ago and met with such warm approval from the cooperative organizations doing business in the State that these groups took the initiative in inducing the last legislature to provide special funds to permit the college to increase this type of work. The cooperative selling of American cheese and tobacco will be emphasized in one series of institutes, while poultry, butter, and eggs will be given attention in a second series. In communities where it would be especially applicable, the discussion will have to do with the marketing of foreign type cheeses, fluid milk, and livestock. Only one commodity will be discussed in a particular meeting.

The purpose of the institutes is not to organize marketing units but primarily to educate farmers as to what they may expect of their cooperative associations. The State thus recognizes its obligation to supply this educational information to its farmers, and the three-day intensive marketing institutes have demonstrated that they are peculiarly effective in accomplishing this end.

The total enrollment of the university on October 1 was 9,023, an increase of 8.8 per cent over the corresponding date in 1926. Of these students, 376 were registered in agriculture and 333 in home economics, as compared with 371 and 295, respectively, in 1926.

Dr. H. C. Jackson, associate dairy manufacturing specialist in the U. S. D. A. Bureau of Dairy Industry and in charge of the Department's experimental work at the creamery located at Grove City, Pa., has accepted an appointment as chairman of the dairy department in the College of Agriculture, effective Sep-

tember 15. Dr. E. H. Farrington, for 33 years head of the dairy department, has been appointed emeritus professor of dairy husbandry. The new budget of the university calls for an appropriation of $25,000 to provide for the modernization of the equipment of this department.

L. F. Graber, professor of agronomy and agronomist, has been granted leave of absence for the academic year to take up graduate work at the University of Chicago. W. P. Popham has been appointed instructor in landscape design; C. R. Strange, instructor in veterinary science; and F. F. Burk, instructor in vegetable gardening.

Forest Experiment Stations.—The Allegheny Forest Experiment Station has now been added to the group of regional stations maintained by the U. S. D. A. Forest Service. It will serve the forest interests of Pennsylvania, Maryland, Delaware, and New Jersey, and will have a staff of from five to eight men. R. D. Forbes, director of the Southern Forest Experiment Station, has been appointed director of the new station.

Dr. John S. Boyce, pathologist in charge of the Portland, Oreg., headquarters of the forest pathology work of the U. S. D. A. Bureau of Plant Industry, has been appointed director of the Northeastern Forest Experiment Station at Amherst, Mass. This appointment will be effective early in 1928, the station in the interim being in charge of M. Westveld, associate silviculturist, as acting director.

Dominion Grain Research Laboratory.—This laboratory has been established in Winnipeg, Manitoba, under a Dominion appropriation for building and equipment. The laboratory is under the supervision of the Board of Grain Commissioners, and its establishment was advocated in a report by the Royal Grain Commission in 1925 as an agency to assist in the solution of technical problems.

The plant consists of eight rooms and includes an experimental milling department, a baking room, a general laboratory, a research laboratory, offices, and storerooms. It is hoped to install a model grain drier at a later date, so that drying may be conducted under controllable and semicommercial conditions.

Some of the studies which are at present under investigation include the milling and baking value of dried grain, the correct temperature at which grain should be dried, and the milling and baking value of grain of unestablished variety. The milling and baking value of sprouted, immature, frozen, and spring threshed grain has been under investigation for a considerable period. The laboratory is also conducting investigations in conjunction with the Universities of Manitoba, Saskatchewan, and Alberta under the supervision of the National Research Council, the main study at present being the milling and baking value of tough and dried grain.

Nova Scotia Agricultural College.—J. M. Trueman, for the past year director of agricultural extension in Nova Scotia, has been appointed principal. W. V. Longley has been appointed director of agricultural extension and professor of farm economics.

Eighth International Horticultural Congress.—This congress held its opening session in Vienna September 20, commemorating the one hundredth anniversary of the Austrian Horticultural Society. Sixteen countries were represented by 400 delegates. Among the questions discussed were the formulation of international agreements on uniform horticulture, nomenclature, and a uniform system of colors, regulation of the naming of novelties, and the feasibility of affording legal protection for creators of such novelties. A decision was reached to hold the ninth congress at London in 1930.

EXPERIMENT STATION RECORD

VOL. 57 DECEMBER ABSTRACT NUMBER No. 9

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry of familiar things, S. S. SADTLER (*Philadelphia and London: J. B. Lippincott Co., 1927, 5. ed., rev. and enl., pp. XIII+336, pls. 24, figs. 6*).—This is a popular outline, comprising an introduction and a chapter defining in a general way the fields of chemistry, together with the following subjects: Historical development of chemistry; the periodic system of elements; the chemistry and production of light; heat, combustion, and insulation; air, oxidation, and ventilation; water; alkalies and salts; metals; gold and silver; chemistry of the earth's evolution; soil and its conservation; food elements and food classes; individual foods; animal feeding; fermentation; chemistry of the body; soaps, solvents, and paints; paper and textiles; leather and rubber; silicious substances and glass; the chemical element in scenery; and chemistry since the World War.

"Synthetic milk" as a basis for research, W. M. CLARK (*Jour. Dairy Sci., 10, (1927), No. 3, pp. 195–201, fig. 1*).—The author notes two serious gaps in the information necessary as a preliminary to the formulation of the chief features of the acid base equilibria of cow's milk—the lack (1) of a sufficiently complete and well-interpreted analysis with respect especially to the distribution of phosphates between organic forms and forms involved in the buffer action of milk and (2) of adequate information on the acid base equilibria of even simple systems involving simultaneously the phosphate, calcium, and citrate ions. He points out the value of a complete physical and chemical analysis (despite the variations in the composition of milks) of even one sample, if such an analysis were made with due consideration for sources of error and with such duplication as would insure reasonable completeness for interpretative purposes; and further notes with respect to the study of simple citrate-phosphate-calcium systems that "the very fact of variability, both in chemical composition and in physical stability, precludes simultaneous studies having the completeness that the problem demands," and necessitates preliminary study of this simpler system. Several lines of future investigation are then outlined; the immediate possibilities of a synthetic milk of a gross composition known from the ingredients and of physical properties determined at least roughly by the manner of preparation are suggested; and the following formula,

in which the noncasein proteins are replaced by an equivalent quantity of casein, is proposed as promising:

	Mols.			
Solution 1	0.0074	MgO	0.298 gm.	Dissolve with warming and dilute to 100 cc.
	0.0211	KH_2PO_4	0.873 gm.	
	0.0104	Citric acid. H_2O	2.185 gm.	
Solution 2	0.0014	$CaCO_3$	0.140 gm.	Dissolve cold. Dilute to 50 cc. and use while fresh.
	0.0014	H_2SO_4	28 cc. N/10 H_2SO_4	
Solution 3	0.0141	$CaCl_2$	1.565 gm., or preferably the equivalent of an analyzed solution.	Dilute to 50 cc.
Solution 4	0.0171	KOH	17.1 cc. N/1 KOH	Dilute to 50 cc.
	0.0232	NaOH	23.2 cc. N/1 NaOH	

Solution 5 (for 200 cc. "synthetic milk" in which casein represents total protein)
7.0 gm. casein, 10.0 gm. lactose in 130 cc. N/20 $Ca(OH)_2$ solution.

"To prepare a limewater as strong as N/20, thoroughly saturate the solution while it is cooled with surrounding ice. Add this slowly to the casein while the casein is being ground in a deep glass mortar. Finally stir with a motor-driven stirrer.

"Add 10 cc. of solution 4. When the solution is free from suspended material add 10 gm. lactose. As soon as this is dissolved add at once 10 cc. of solution 3 and 10 cc. of solution 2. Now set the motor at high speed. and to the rapidly stirring solution add very slowly from the fine tip of a pipette 20 cc. of solution 1. When this addition is complete dilute the "milk" to 200 cc."

The similarities of this preparation to, and its differences from, true milk, together with its value in the quantitative solution of the problem of the study of calcium and phosphorus in milk, are discussed.

Nitrogenous metabolism of Pyrus malus L., I, II, W. Thomas (*Plant Physiol., 2 (1927), No. 1, pp. 55–70*).—Two papers are presented.

I. *Influence of temperature of desiccation on water-soluble nitrogenous constituents and separation of water-soluble protein from non-protein constituents* (pp. 55–66).—Samples of leaves and of new shoot growth from Stayman Winesap apple trees were examined for total nitrogen, total water-soluble nitrogen, nonprotein nitrogen, ammonia nitrogen, and amide nitrogen, both in the ground fresh material and in the material dried at 50, 60, and 70° C. before grinding. The results indicated little change in the total water-soluble or nonprotein nitrogen, and the changes in the ammonia nitrogen and amide nitrogen were not much greater than the error to be expected in the determinations except in the case of the woody tissues. The optimum temperature for desiccation seemed to be 60°. For the precipitation of water-soluble protein from the extracts acetic acid, trichloroacetic acid, copper hydroxide, and colloidal ferric hydroxide were tried, with the result that the last named was found the most convenient and rapid reagent since it appeared neither to occlude nor precipitate amino acids and did apparently give a sharper separation of true protein from its decomposition products and permit the quantitative recovery of the adsorbed protein from the residuum.

II. *The distribution of nitrogen in the insoluble cytoplasmic proteins* (pp. 67–70).—Leaf samples were collected from a 15-year-old Stayman Winesap apple tree (1) at the early period of bud formation, (2) at the stage of active maximum growth, and (3) at the period of chlorophyll degeneration. Water-soluble protein was extracted from these samples and they were then dried under diminished pressure. After the extraction of fats, chlorophyll, and lecithin with alcohol and ether and the hydrolysis of interfering carbohydrate

by treatment with 0.5 per cent hydrochloric acid, followed by the filtering off of the samples and washing with hot water, the residua of impure insoluble leaf protein were hydrolyzed by 48 hours' boiling with 20 per cent hydrochloric acid, and the distribution of the nitrogen was determined in the usual manner. The total leaf protein varied somewhat through the vegetative cycle, but the nitrogen distribution showed little change. This is not considered proof of the existence of but one protein in the leaves of *P. malus* through the cycle studied, the possible existence of many proteins of very similar amino acid make-up precluding such a conclusion; but the results are considered to indicate the existence of but a single protein in these leaves throughout the cycle as a probability.

Photosynthesis with ammonia, D. BURK (*Jour. Phys. Chem., 31 (1927), No. 9, pp. 1338–1351*).—Report is made of some 500 photochemical experiments in which it was attempted (1) to secure complex biochemical nitrogen compounds by the action of ammonia upon carbonic acid, formaldehyde, glucose, and other carbonaceous substances, (2) to reduce carbonic acid, bicarbonates, and carbonates, and (3) to oxidize ammonia to hydroxylamine, nitrites, and nitrates. These experiments were conducted with unusual precaution to prevent the accidental introduction of the substance sought as a photosynthetic product, and the sunlight used was so concentrated by means of round flasks filled with water and by other lenses as to increase greatly the local intensity. As the results were wholly negative with the single exception of the oxidation of ammonium compounds to nitrates in the presence of ferric ions, it is concluded that "considerable doubt has been thrown upon the positive photosynthesis results" of the various authors who have employed sunlight and inorganic catalysts.

The sugars and their derivatives, M. CRAMER (*Les Sucres et Leurs Dérivés. Paris: Octave Doin, 1927, pp. XIV+353, figs. 6*).—This volume of the Chemical Library of the Scientific Encyclopedia, directed by A. Pictet, is a condensed general account of the chemistry of the sugars. Part 1 deals with the monosaccharides, their general properties, the principal derivatives of the aldyhyde and alcoholic groups, the sugar anhydrides, the synthesis of sugars, configuration and optical activity, sugar structure, and the preparation and properties of the principal sugars of the group. The section is concluded with an appendix on the amino sugars. Part 2, on the polysaccharides, takes up much more briefly the constitution of the polysaccharides and some account of the attempts which have been made at their synthesis, together with the preparation and properties of the principal polysaccharides. A table of the physical properties of the more important disaccharides, including those of some of their derivatives, is added to this section. Part 3, also much shorter than part 1, is concerned with the more complex carbohydrates, the starches, glycogen, inulin, and cellulose, and with the products obtained from these substances by the various methods which have been used in attempts to elucidate their structure.

Pictet's preface notes that the author's object was a book to be read rather than merely to be consulted. An extensive bibliography (pp. 317–349) is appended.

Factors influencing the loss of iodine from iodized salt, A. H. JOHNSON and B. L. HERRINGTON (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 167–183*).—The study is reported from the Montana Experiment Station of iodine losses through the storage of various forms of iodized salt held in pasteboard boxes; in open glass jars in an open shed; in burlap bags in a barn loft; in desiccators maintained at relative humidities of 100, 50, 20, and 0 per cent, alkali being placed in the desiccators maintained at 50 and 20 per cent to prevent the accumulation of iodine in the desiccator atmosphere to such an extent

as to prevent normal loss; in bell jars with addition to the salt of 1 per cent of potassium acid phosphate or of 1 per cent of sodium bicarbonate; out of doors, where subject to leaching by rains; under direct sunlight or under sunlight passing through glass under various conditions of temperature; exposure to ultra-violet or to infra-red irradiation, etc. The effect of the method of crystallization upon stability of salts iodized with potassium iodide and the relative stability of salts iodized with potassium iodide and potassium iodate were also determined. Most of the storage experiments were continued, with periodic analysis, for one year or more.

It was found, in part, that iodine losses, appreciable in practically all the experiments noted, were increased by increasing freedom of air circulation, and that the prevention of the circulation of air practically prevented iodine losses in storage periods of one year or more, provided that excessive humidity and light exposure were avoided. Humidity up to 50 per cent did not cause loss, and in fact the losses appeared less at about 50 per cent relative humidity than at lower or higher humidities. On exposure to sunlight for two days, a thin layer of salt iodized with potassium iodide lost 40 per cent of its iodine content. Adding the iodine as iodate, or the addition of 1 per cent of sodium bicarbonate to salt iodized with potassium iodide, reduced the loss, but there is some question as to the safety and efficiency of potassium iodate as a source of iodide for salt. The formation of mixed crystals of sodium chloride and potassium iodide was not indicated in the crystallization experiments.

On the determination of lead as a cyanide [trans. title], S. GRUNDT (*Compt. Rend. Acad. Sci. [Paris], 185 (1927), No. 1, pp. 72, 73*).—The experiments reported were made with a view of testing the method of W. Herz and E. Neukirch [1], consisting essentially in precipitating the neutral lead solution with an excess of an alkali cyanide, the weight of the precipitate after washing with cold water and drying at 95° C. having corresponded well with the formula $Pb(CN)_2$. The precipitate was found to consist in fact of white lead or basic lead carbonate, the lead content of which is the same as that of the cyanide supposed to be obtained. Attempts to prepare a true normal lead cyanide of the formula given either in aqueous or alcoholic solution resulted only in the formation of basic compounds.

Acidimetric and alkalimetric titrations [trans. title], A. GRÉGOIRE (*Ann. Gembloux, 33 (1927), No. 8, pp. 277–295, figs. 5*).—This is an instructive discussion of the acidimetric and alkalimetric titrations and the behavior and suitability of indicators on the basis of the theory of acid base equilibria.

The quinhydrone electrode and its applications [trans. title], E. BIILMANN (*Bul. Soc. Chim. France, 4. ser., 41 (1927), No. 3, pp. 213–286, figs. 16*).—This is a general discussion of the theory and practice of the quinhydrone electrode and of its two modifications, the hydroquinhydrone electrode and the quinoquinhydrone electrode. The paper comprises an introduction and sections on the potential of the quinhydrone electrode, electromotive reactions, the influence of the H-ion concentration upon the potential of the quinhydrone electrode and the determination of pH, the influence of temperature on the potential, the range of applicability of the quinhydrone electrode, the application of the quinhydrone electrode to alkaline solutions, the influence of the total concentration of electrolytes upon the electrode ptoential and quinoquinhydrone and hydroquinhydrone electrodes, the correction for the influence of salts, nonaqueous solutions, the preparation of quinhydrone, the preparation and treatment of the metallic electrodes, and practical applications of the quinhydrone electrode, the latter chapter including the subheads quinhydrone standard electrodes, p

determinations and electrometric titrations, determinations of soil acidity, examination of milk and dairy products, and the determination of the pH of various biological liquids. A final chapter gives formulas and tables for pH determinations, and discusses their use. A bibliography of about 80 references is appended.

Simple experiments on the approximate estimation of particle-size in hydrosols [trans. title], R. ZSIGMONDY and C. CARIUS (*Ber. Deut. Chem. Gesell., 60 (1927), No. 5, pp. 1047–1049*).—The dependence of the ultramicroscopic method of determining particle-size upon both the visibility and the approximate uniformity of the colloidal particles and that of the centrifugal sedimentation rate method upon such powerful and expensive equipment as the ultracentrifuge is noted, and determination, where an approximate value will serve, by filtration through filters of known pore diameter is recommended.

Experiments indicating the practicability of such determinations were made with hydrosols of silica, mercury, arsenic sulfide, antimony sulfide, iron oxide, etc. Among these tests was a filtration of a silica sol, which had been aged 15 years and was only partially and with difficulty visible in the ultramicroscope, and which was almost completely retained in such a condition as to be readily wiped off upon the surface of a relatively large pored filter membrane. In general, it is considered that hydrosols are often judged to be very minutely particulate when of a homogeneous appearance and impossible to secure by laboratory methods in sediment layers of appreciable thickness, although as a matter of fact such sols may sometimes be very coarsely particulate—coarser indeed than readily sedimented gold suspensions (particular diameter from 60 to 100 $m\mu$). The filtration method is rapid and convenient and readily distinguishes between coarse and fine, and between uniform and nonuniform, hydrosols.

Buffers of milk and buffer value, J. H. BUCHANAN and E. E. PETERSON (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 224–231, fig. 1*).—Determinations of titration curves for unaltered milks and for samples to which water or certain phosphates had been added showed that the calculated buffer value or buffer index[1] of Van Slyke (the differential ratio $\frac{dB}{dpH}$, expressing the relationship between the increment in gram-equivalents per liter of a strong base, *B*, added to a buffer solution, and the resulting increment of pH) varies with the pH range in which it is determined, being most definite in the range pH 8.5 to 9.0, with an average value of 0.0067. Casein was found to have little buffer effect in the region of its isoelectric point, since the precipitation of this protein influenced the buffer value of the milk but slightly. The milk phosphates are considered as being among the most important milk buffer substances, this being indicated by the fact, among others, of the close similarity between the milk and disodium hydrogen phosphate titration curves.

Methods for the examination of milk and dairy products, K. TEICHERT (*Methoden zur Untersuchung von Milch und Milcherzeugnissen. Stuttgart: Ferdinand Enke, 1927, 2. ed., rev., pp. XV+453, figs. 66*).—This is a second edition of this book, previously noted (E. S. R., 24, p. 413).

Standard methods of milk analysis: Bacteriological and chemical (*New York: Amer. Pub. Health Assoc., 1927, 5. ed., pp. [6]+55, figs. 14*).—This is the fifth edition of this work, previously noted (E. S. R., 51, p. 579). The methods have been revised and brought up to date.

Further investigations with adulterating sulphuric acid so as to increase Babcock test reading, W. E. PETERSEN (*Jour. Dairy Sci., 10 (1927), No. 3, pp.*

[1] Jour. Biol. Chem., 52 (1922), No. 2, pp. 525–570.

261, 262).—An adulteration consisting essentially in emulsifying with the acid a saturated benzine solution of fat and a small proportion of a strong aqueous soap solution is described. This adulteration would not be detected in running the Babcock test in the ordinary way, since the adulterated acid behaves normally, but would distinctly increase the fat reading. Dilution of the acid with an equal volume of water and centrifuging as in the Babcock test causes a separation, however, by which the adulteration is demonstrated unmistakably.

A method for testing moisture in dried prunes, E. H. WIEGAND and D. E. BULLIS (*Oregon Sta. Circ. 82 (1927), pp. 8, figs. 3*).—Herein is briefly described a simple distillation apparatus devised for the rapid determination of moisture in prunes, which upon receipt at the packing plants were found to vary greatly in moisture content, an important consideration, since above 20 per cent the keeping quality is impaired. Toluene, nonmiscible in water and with a boiling point of 114° C. (237.2° F.) was used as a medium of distillation.

The chemical analysis of cotton.—XVII, The effect of the disruption of the cotton hair on the extraction of fat, wax, and resin, R. G. FARGHER and L. HIGGINBOTHAM (*Brit. Cotton Indus. Research Assoc., Shirley Inst. Mem., 6 (1927), No. 6, pp. 71-75*).—From experiments on the extraction of the combined fat, wax, and resin of gray or gray-soured cotton, followed by an extraction of the same material after tendering with either hydrochloric acid or hydrochloric acid with sodium chloride, it is concluded that while a single extraction does not remove the fat, wax, and resin completely from the fiber, there is no advantage in multiple extraction methods over the single extraction process in gauging the effectiveness of a scour. The utility of the dual extraction described is confined solely to the relatively closer estimate of the fat, wax, and resin which is obtained.

METEOROLOGY

Report of the chief of the Weather Bureau, 1925–26 (*U. S. Dept. Agr., Weather Bur. Rpt. 1926, pp. III+254, pls. 7*).—A brief administrative report discussing legislation in support of air navigation, fire-weather warnings, and precipitation and level of the Great Lakes is given, with a review of the general weather conditions of each month of 1925, including also observations on tornadoes, hail, sunshine, excessive rainfall, and losses from windstorms, and the usual detailed tabulations of meteorological data for pressure, temperature, precipitation, humidity, cloudiness, wind, and evaporation throughout the United States.

Monthly Weather Review, [May–June, 1927] (*U. S. Mo. Weather Rev., 55 (1927), Nos. 5, pp. 211–261, pls. 13, figs. 16; 6, pp. 263–292, pls. 11, figs. 5*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for May and June, 1927, and bibliographical information, notes, and abstracts, these numbers contain the following contributions:

No. 5.—The Northeast Trade Winds of the North Pacific (illus.), and Free-Air Winds Over Honolulu and Guam, both by E. A. Beals; Notable Tornadoes of May, 1927, by G. Reeder, H. S. Cole, and A. W. Shilling; Washington, D. C., Tornado of May 14, 1927, by L. T. Samuels; Tornado of May 24, 1927, at St. Joseph, Mo., by W. S. Belden; Rain-Bearing Winds in the Far Western States (illus.), by T. R. Reed; Twelve Years of Long-Range Forecasting of Precipitation and Water Levels, by A. Wallén, trans. by B. M. Varney; Blue-Sky Measurements (illus.), by I. F. Hand; and New Definitive Scale for Solar-Constant Values, by C. G. Abbot.

No. 6.—A Group or Correlation Periodogram, with Application to the Rainfall of the British Isles (illus.), by D. Alter; Solar Radiation Observations at

Apia, Somoa (illus.), by A. Thomson; Unique Destruction of a Tulip Tree by Lightning (illus.), by F. P. Norbury; Lightning, by N. E. Dorsey; Tornado of June 3, 1927, Near Topeka, Kans., by S. D. Flora; and Tornado at Auburn, Kans., June 3, 1927, by E. C. Corkill.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and E. H. WHEELER (*Massachusetts Sta. Met. Buls. 463–464 (1927), pp. 4 each*).—The usual summaries and notes are given of observations at Amherst, Mass., during July and August, 1927.

Meteorological report for the year 1926 (*Montana Sta. Rpt. 1926, pp. 21–23*).—Observations on maximum and minimum temperatures, wet and dry bulb thermometer readings, wind velocity and direction, hours of sunshine, amount of precipitation, and evaporation at Bozeman, Mont., are summarized.

The highest temperature recorded was 94° F., August 25, the lowest −25°, December 14. The total rainfall was 20.02 in. The number of clear days was 122. The last killing frost in spring occurred May 31, the first in the fall September 19. The total evaporation, April–October, was 33.84 in.

"September had a precipitation of 1.31 in. above normal. This extra supply, coming when it did, was beneficial in starting the growth of winter wheat, but the fact that there were 16 days with 0.01 in. or more precipitation had a very decided influence in retarding the harvesting and threshing operations. . . . The evaporation for June and July was below normal, owing to a subnormal wind velocity for those months. This condition was favorable for plant growth and especially so since these same months had a precipitation below normal and a temperature above normal."

Phenological observations in 1926 [trans. title], H. BOS ET AL. (*Landbouwk. Tijdschr. [Utrecht], 39 (1927), Nos. 466–467, pp. 294–313, figs. 2; 468, pp. 326–329, figs. 2*).—A brief review of phenological observations in general during the year is given, with more detailed data of observations on plants, insects, and fungi in the Netherlands.

Phenological observations in Moravia and Silesia, 1923 and 1924 [trans. title], V. NOVÁK and J. ŠIMEK (*[Czechoslovakia] Min. Zeměděl., Zpr. Výzkumn. Úst. Zeměděl., No. 16 (1926), pp. 72, pls. 7; Ger. abs., pp. 66–68; Eng. abs., pp. 69–71*).—Data furnished by 341 observers in 1923 and 501 in 1924 are summarized and discussed. From data for blossoming dates of the pear, apple, cherry, sorb (*Sorbus aucuparia*), horse chestnut, blackhorn (*Prunus spinosa*), elder (*Syringa vulgaris*), and red currant, maps were made which show the "coming of spring" and when field work may begin in different parts of Czechoslovakia. The results of the phenological observations were fonnd to agree in general with the progress of the weather conditions. During both years there was observed to be "a great reaction of the weather on the coming of spring and of the harvest."

An investigation of periodicities in rainfall, pressure, and temperature at certain European stations, D. BRUNT ET AL. (*Quart. Jour. Roy. Met. Soc. [London], 53 (1927), No. 221, pp. 1–30, pls. 2, figs. 3; abs. in Sci. Prog. [London], 22 (1927), No. 85, pp. 35, 36*).—Periodogram analyses of data extending over at least 100 years, beginning in 1764 and including rainfall at Milan, Padua, London, and Edinburgh; pressure at Edinburgh and Paris; and temperature at Edinburgh, Stockholm, London, Paris, Berlin, and Vienna, are reported, and the results are discussed with special reference to the possible value of any of the periodicities for forecasting, as suggested by Beveridge (E. S. R., 48, p. 613). Forty-four periods ranging from 12⅛ months to 35 years were found, at least half of which had already been reported by other investigators. It is suggested that "the periods or at least the shorter ones, are natural periods of oscillation

of the general circulation of the earth's atmosphere, which are perhaps set in motion by causes external to the earth itself." The general conclusion was reached that the analysis of the periodogram is of no value for forecasting.

Periodicities in European weather, D. Brunt (*Roy. Soc. [London], Phil. Trans., Ser. A, 225 (1926), pp. 247–302, figs. 24*).—This is another account of the studies noted above.

SOILS—FERTILIZERS

List of the publications on soils issued by the U. S. Department of Agriculture, 1844–1926, compiled by E. B. Hawks and C. Trolinger, (*U. S. Dept. Agr. Library, Bibliog. Contrib. 14 (1927), pp. 63*).—This is a mimeographed list of the Department's publications on soils, prepared primarily for use at the First International Congress of Soil Science, and inclusive in scope.

List of the publications on soils issued by the State agricultural experiment stations of the United States through 1926, compiled by C. L. Feldkamp and C. E. Pennington (*U. S. Dept. Agr., Library, Bibliog. Contrib. 15 (1927), pp. 81*).—This is an inclusive list, in mimeographed form, arranged according to States, and largely included in Bibliographical Contribution 13 (E. S. R., 57, p. 410). It was prepared primarily for use at the First International Congress of Soil Science.

Florida State Geological Survey seventeenth annual report, 1924–1925, H. Gunter et al. (*Fla. Geol. Survey Ann. Rpt., 17 (1924–25), pp. 275, pls. 2, figs. 5*).—This contains mineral production statistics for 1924; notes on Florida soil investigation history and on the new soil map, including descriptions of the principal soils of Florida, their locations, and the areas covered by each; and, in review, some structural and stratigraphic data.

It is estimated that about 80 per cent of the land area may be classed roughly as sand, 3 per cent as red clay, and 12 per cent as muck, with the remainder mostly marl and limestone. "Although Florida has some patches of very rich soil, the average fertility is probably less than in any other State of the Union." Potash is the chief lack in most of the soils.

Further studies on Michigan soil profiles with special reference to dispersed materials, M. M. McCool, A. G. Weidemann, and G. Schlubatis (*Soil Sci., 23 (1927), No. 5, pp. 391–398*).—In this contribution from the Michigan Experiment Station, data are presented on the rate of dispersion of the fine material from the A_1, A_2, and B_1 horizons of the Ontonagon soil profile, on the heat of wetting in calories per gram, and the nitrogen content of the dispersed materials from the same horizons of the same profile, and on the heat of wetting and the colloid content as estimated by the heat of wetting of the soil and of the isolated colloidal material for various horizons of Fox sandy loam, Hillsdale heavy sandy loam, Napanee silt loam, Kewanee loam, Brookston silt loam, Strong light sandy loam, Chippewa light sandy loam, Onaway loam, Stalwart light sandy loam, and Ontonagon silt loam, together with the nitrogen content of the whole soil and of the fine material in various horizons of this latter series of soils.

Soil survey of Douglas County, South Dakota, W. I. Watkins and B. H. Williams (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+577–598, fig. 1, map 1*).—Douglas County comprises an area of 284,000 acres in the southeastern part of South Dakota between the Missouri and James Rivers. The surface of this area varies from flat to rolling, but by far the greater part is flat to undulating. Drainage in the eastern three-fifths of the county is fairly good, but the western part of the county has no naturally developed drainage ways, the surplus water in this section collecting in the

numerous lakes, sloughs, potholes, and low places, varying in size from less than an acre to a square mile or more.

In cooperation with the South Dakota Experiment Station, the soils of this area have been mapped and classified as 7 series of 16 types, Barnes silt loam covering the largest area, 56.5 per cent of the total, while Barnes loam with 16.9 per cent covers the only other large percentage of the area in one soil type.

Fruit soil surveys, T. WALLACE (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1926, pp. 18–28, pls. 2*).—The purpose, general scheme, and methods of the fruit soil survey are briefly stated, the three main objectives being (1) a determination of the part which soil conditions play in fruit growing as carried out in the neighborhood of this station, (2) to ascertain the particular problems of fruit growing specifically due to soil factors, and (3) to classify the various soil conditions found in the area concerned and to relate these conditions to the first two subjects of investigation. Results reported on two districts designated as the Bromyard and Ross areas, respectively, indicate the possibility of correlating more or less closely the nature of the soils with the results which may be expected from the attempt to grow fruit trees upon them. Of the four classes established, "practically all the highly successful trees occur on class A soil conditions," in the Bromyard area, while in the Ross area the restrictions were scarcely less striking.

The hydrometer as a new method for the mechanical analysis of soils, G. J. BOUYOUCOS (*Soil Sci., 23 (1927), No. 5, pp. 343–352, pls. 2*).—This is a preliminary report, accompanied by data on 25 soil samples, upon hydrometer determinations of suspension densities at various time intervals as a means of estimating the percentage of colloids and other relatively fine materials in the soil. Zuevenne's lactodensimeter was used in these preliminary experiments, though a more suitable instrument was subsequently constructed. Figures representing the weight in grams per liter of fines and colloids remaining in suspension after successive 1-minute intervals up to 20 minutes and subsequently after various longer periods are tabulated for each of the following samples: Ohio silt loam, Tennessee silt loam, Urbana clay loam, California Yolo clay loam, California Yolo clay, Ontonagon silt loam A_1, A_2, and B_1, Stewart loam A_1, A_2, and B_1, Onaway loam A_1, A_2, and C_1, Napanee silt loam A_1, B_1, and C_1, Hillsdale sandy loam A_1, B_1, and B_2, Chippewa fine sandy loam A_1 and B_1, and Fox loam A_1, B_1, and B_2. The original suspensions in each case consisted of 75 gm. of the whole soil dispersed in 1 liter of water. The method gave promise of a rapid estimation of particle size distribution and of approximate percentages of fines and colloids.

Factors affecting the hydrogen-ion concentration of soils, L. D. BAVER (*Soil Sci., 23 (1927), No. 5, pp. 399–414, figs. 3*).—This contribution, from the Ohio Experiment Station, reports on the effect of air-drying, of grinding, and of fertilizer treatments on pH determinations made on Wooster silt loam, and notes also periodical variations in the reaction and the effect of surface treatment on the reaction of subsurface layers.

The H-ion concentration of the surface soil was not appreciably affected by air-drying, though alkaline soils decreased in alkalinity and subsoil samples showed large increases in acidity. Grinding acid samples of the Wooster silt loam appeared not to change the reaction appreciably, but alkaline samples decreased in alkalinity. Brookston and Miami clay and Dunkirk fine sand showed considerable decrease in acidity upon grinding, the changes in these cases being tentatively attributed to the exposure of basic materials. Seasonal variations in degree of acidity were noted, alkaline soils showing variations

ranging from 0.6 to 0.7 pH from May to September, while acid soils varied as much as 0.92 pH during that period. Fertilizers, with the exception of ammonium sulfate, did not appear to influence the H-ion concentration to any considerable extent, though acid phosphate, sodium nitrate, bone meal, basic slag, and manure tended to reduce it slightly. Surface treatment was found to influence markedly the reaction at lower depths. Over a period of 11 years, 4 and 8 tons of ground limestone every 4 years, in a rotation, affected the reaction of the subsoil to a depth of 28 in. Two tons of limestone per acre, however, produced an effect appreciable only in the surface layers.

It is concluded, with regard to methods, that air-dried samples appear to give results sufficiently accurate for any ordinary purposes, though fresh, moist samples should be used for making detailed reaction studies. Samples should not be ground, since grinding affects the reaction to an extent sufficient to give results that may be misleading. The periodic variation in soil pH should be considered in all measurements of soil H-ion concentration.

Method of preparation of soil suspensions and degree of dispersion as measured by the Wiegner-Gessner apparatus, G. WIEGNER (*Soil Sci., 23 (1927), No. 5, pp. 377–390*).—Using the apparatus of Wiegner (E. S. R., 41, p. 621) as modified by Gessner[1], the author has investigated the effect of various modifications of method in the preparation of soil suspensions for determinations of the degree of dispersion, with results in part as follows:

The effect of preparation by shaking, by rubbing, or by cooking is dependent upon the electrolyte content. If the soil suspension is thoroughly washed and has but a small electrolyte content, the cooking procedure has a more strongly dispersing action than the other two procedures, the particles being, in the practical absence of electrolytes, all charged above the critical potential. In the presence of appreciable quantities of electrolytes, however, the cooking method is likely to produce more coagulation than the other treatments. Freezing produces coagulation in the presence of electrolytes, but the degree of dispersion of thoroughly washed soils is not detectably affected by freezing. Added ammonia up to an optimum concentration of 0.1 N had a dispersing effect on carbonate-free and carbonate-containing soil suspensions which had not been well washed, but the washing out of the electrolytes with distilled water produced, in both cases investigated, more dispersion than the addition of ammonia to the unwashed samples. Lime- and humus-bearing samples gave irregular results in preparation by 15-minute cooking, ammonia increasing the dispersion. The most effective procedure for increasing the dispersion was the solution of the carbonate with dilute hydrochloric acid in the cold, thorough washing, and finally the addition of 0.1 to 0.5 N ammonia solution.

Texture and structure of soils as influenced by chemical agents, G. J. BOUYOUCOS (*Jour. Amer. Soc. Agron., 19 (1927), No. 9, pp. 788–797*).—Continuing a study, previously noted (E. S. R., 52, p. 418), on the disintegration when wetted of dried blocks or balls of soil, this contribution from the Michigan Experiment Station reports the effect of 1 N, 3 N, and 5 N, and, where such a concentration was not in excess of saturation, of 7 N solutions of sodium chloride, potassium chloride, calcium chloride, sodium nitrate, ammonium nitrate, sodium sulfate, calcium acid phosphate, nitric acid, hydrochloric acid, potassium hydroxide, and sugar. The results with these various concentrations of each compound are separately tabulated.

The rate and character of the disintegration were found to depend upon the nature of the reagent, upon the concentration, and upon the type of soil. Some

[1] Mitt. Lebensmtl. Untersuch. u. Hyg., Eidg. Gesndhtsamt. [Switz.], 13 (1922), No. 4, pp. 236–243.

soils disintegrated very rapidly into fine particles in all the reagents and in all concentrations, while others disintegrated at a rate diminishing with increasing concentration, so that the time required for disintegration in the highest concentration of some of the reagents was 7 hours, as against 20 minutes for disintegration in water. These results are considered probably attributable principally (1) to a coagulation of the soil colloids by high concentrations of some of the more active reagents, and (2) to a penetration rate decreasing with increasing concentration.

The possible bearing of such experimental results on the washing out or gullying of soils is noted.

Modifications of the nitrogenous substances in soil dried in the open air and subsequently fallowed [trans. title], A. LEBEDIANTZEF (*Compt. Rend. Acad. Sci.* [*Paris*], *185* (*1927*), *No. 4, pp. 293–295*).—Continuing a study of the chemical and bacteriological changes in desiccated soils (E. S. R., 53, p. 419), desiccated soil samples were wetted to a moisture content of 33 per cent basis of the absolutely dry soil, spread out in layers 10 cm. deep on iron plates 0.5 meter square, and held in fallow condition for 6 months. Check samples not previously desiccated were similarly treated. The experiment was carried out at a temperature of 15 to 20° C., moisture being maintained at 30 per cent by watering with distilled water as required. Care was taken to prevent the drying out of the upper layer and to avoid mixing of the layers in the periodic removal of the samples for analyses. The soils examined were taken (1) from the first 20 cm. of depth of land under a 3-year rotation, (2) from the first 40 cm. of land similarly treated, and (3) from the first 20 cm. of fallow land. Determinations of nitrate nitrogen and ammonia nitrogen in both dried and undried samples of the three kinds of soil at the beginning of the experiment and after intervals of 12, 25, 46, 67, 86, 112, and 180 days are tabulated. The figures indicate (1) a greater accumulation of nitrates in the dried than in the undried samples, developing gradually throughout the experiment, and (2) a rapid immediate increase in the ammonia nitrogen as a result of the desiccation, the figure diminishing during the first 2 weeks and then again increasing and remaining at a high level for 4 or 5 months.

Modifications of the solubility of phosphoric acid and of the biological properties of soils observed during the fallow period of soil previously dried in the open air [trans. title], A. LEBEDIANTZEF (*Compt. Rend. Acad. Sci.* [*Paris*], *185* (*1927*), *No. 6, pp. 397–399*).—Continuing the comparative study of the three soils described in the work noted above, the author tabulates determinations of phosphoric acid soluble in water, in 2 per cent acetic acid, and in 0.5 per cent oxalic acid, together with bacterial counts in millions per gram on a basis of the absolutely dry soil. The examinations were made at intervals the same as in the above-noted nitrogen study. As a further indication of biological activity, data on the evolution of carbon dioxide are also tabulated.

The water soluble phosphoric acid, increased markedly by the drying, had returned at the end of 25 days to the value found for the undried soil, but the phosphoric acid dissolved by the acetic and oxalic acid solutions showed an increase in the figures for the dried soils which continued evident for a much longer time. The bacterial counts were diminished by the drying, and remained low for 2 to 3 months under the fallow conditions of the experiment. This did not appear to be an index of the fermentative activity, however, since the carbon dioxide production was greater in the dried soils than in those which had not been subjected to desiccation.

The influence of ammonification on elementary sulfur in the soil [trans. title], G. GUITTONNEAU (*Compt. Rend. Acad. Agr. France, 13* (*1927*),

No. 24, pp. 808–813).—Experiments on the effect of adding 4 to 5 gm. of peptone to each kilogram of soil upon the sulfofication rate indicated that, though the production of sulfates was initially retarded, the rate of solubilisation of sulfur, added either as flowers or as precipitated sulfur, was noticeably increased. The soluble sulfur compounds formed practically always included "hyposulfites" (thiosulfates?). The hyposulfite is later converted by other organisms into sulfate. The intermediate oxidation products of sulfur were found not to interfere with the multiplication of microorganisms, this being very active in the known presence of such partially oxidized sulfur compounds; and, in collaboration with others, the author showed that from 10 to 20 per cent of hyposulfites did not interfere with soil protozoa. It was also found that many bacteria, actinomyces, and molds could assimilate sulfur from hyposulfites.

Effect of moisture, temperature, and other climatic conditions on R. leguminosarum in the soil, S. C. Vandecaveye (*Soil Sci., 23 (1927), No. 5, pp. 355–362*).—Noting in a brief review of the literature marked variation in the reported ability of the legume bacteria to resist drying, the author presents the results of pot experiments at the Washington Experiment Station in the greenhouse and out of doors, in which he finds *Rhizobium leguminosarum* grown in Palouse silt loam to be capable of surviving exposure to wide extremes of soil moisture without apparent effect upon subsequent nodule production. Soil moisture excessive to the point of saturation or flooding was much more detrimental than extreme dryness approaching the air-dry condition. Extreme summer and winter temperatures appeared to be without injurious effect upon nodule production by legume bacteria in the soil. Legume bacteria for alfalfa, peas, and sweet clover, once inoculated into the semiarid soils of eastern Washington, readily produced nodules and survived climatic variations for 10 to 15 years or more in the absence of the host plant. Distribution by wind and dust storms was detected, but is not considered sufficient for the thorough inoculation of legumes planted in new fields.

Sociological and ecological studies on the tropical weed vegetation of Pasuruan (the island of Java), W. J. C. Kooper (*Rec. Trav. Bot. Néerland., 24 (1927), No. 1–3, pp. 1–255, pl. 1, figs. 65*).—This voluminous report is based upon detailed and numerous observations on the relation of weed communities, both to soil characteristics and to the actual behavior under cultivation of the soils studied. The impression likely to be gained from the superficial observation, of a very general and very similar distribution of any particular weed species, is found incorrect in a closer observation directed to the recognition of characteristic communities of species. The characteristics, occurrence, and variations in composition of 15 such communities in the plain of Pasuruan are summarized in 15 of the 27 appended tables. The author concludes that valuable indications with respect to the suitability of soils for specific cultivated crops can be obtained from such studies of the natural or invading weed flora. The soils of the area investigated are classified on this basis with respect to suitable varieties of sugar cane. A soil map of the area studied is appended.

Soil management, F. E. Bear (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, 2. ed., rev. and enl., pp. V+412, [pl. 1], figs. [57]*).—This is a general textbook on the subject, essentially similar to the first edition (E. S. R., 51, p. 116), but thoroughly revised and considerably enlarged.

The current mineral nutrient content of the plant solution as a possible means of chemical control of optimum fertilization, B. E. Gilbert and L. J. Hardin (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 185–192*).—In general, the current concentrations of mineral nutrients in the crop plant solutions were found, in this work at the Rhode Island Experiment Station with a

variety of market garden crops, to be correlated with the chemical fertilizer applications. Potassium showed the least fluctuation during the season, nitrate nitrogen fluctuated most, and phosphate phosphorus gave an intermediate value. The current mineral nutrient content of the plant solution is suggested as a fertilizer requirement index, tentative critical concentrations of 3,000 parts per million of potassium in the roots or tops, 20 parts per million of phosphate phosphorus in the roots, and 300 parts per million of nitrate nitrogen in leaf blades being suggested.

Crop yields from Illinois soil experiment fields in 1926, F. C. BAUER (*Illinois Sta. Bul. 296 (1927), pp. 40, fig. 1*).—Major and minor series of experiments on 31 experiment fields are recorded in 51 tables, the work being for the most part a continuation of that previously noted (E. S. R., 55, p. 624).

Concentrated fertilizers: The need and means of production, C. W. DABNEY (*Manfrs. Rec., 91 (1927), No. 16, pp. 65–67*).—This is a discussion of ways and means of securing an adequate fertilizer supply at reasonable cost, especially for the western and southern portions of the United States. The waste involved in transporting fertilizing materials containing only 15 to 16 per cent of total plant foods is pointed out, and the possibility of the adaptation of processes already used to some extent for the economical production of concentrated fertilizers at reasonable prices is dealt with in a brief, nontechnical review.

Fertilizer consumption and crop yields [trans. title], H. HITIER (*Jour. Agr. Prat., n. ser., 48 (1927), No. 34, pp. 149, 150*).—An attempt is here made, based on the statistics of fertilizer consumption in France for the years 1913 and 1926, to correlate increased general crop yields with increased consumption of nitrogenous, phosphatic, and potassic fertilizers.

Relative lime needs of sulfate of ammonia and nitrate of soda and of different crops, B. L. HARTWELL and S. C. DAMON (*Jour. Amer. Soc. Agron., 19 (1927), No. 9, pp. 843–849*).—The results for the period 1915–1926 of a field comparison at the Rhode Island Experiment Station of the effects of equal amounts of nitrogen applied as sulfate of ammonia and of nitrate of soda, previously noted (E. S. R., 32, p. 622), are described and discussed. The four plats used in these experiments were treated with nitrate of soda, limed and unlimed, and with ammonium sulfate, limed and unlimed. To obtain a given reaction, 147 lbs. more lime per year were required with the sulfate of ammonia than with the nitrate of soda, and, as the average annual application of nitrogen was 49 lbs., each 100 lbs. of sulfate of ammonia required about 80 lbs. of hydrated lime, or 120 lbs. of limestone, more than was required by 128 lbs. of nitrate of soda, supplying the same amount of nitrogen.

The conclusion is reached that the theoretical requirement of 4 lbs. of calcium oxide to 1 lb. of nitrogen supplied as ammonium sulfate should be the basis of future liming to maintain land fertilized with sulfate of ammonia at the same reaction as if fertilized with nitrate of soda. The crop yields were about equal with the two sources of nitrogen when the same reaction in the soil (Merrimac silt loam) was secured by suitable liming.

By-products of the sugar industry as fertilizers: Trash, tops, bagasse, filter press cake, and molasses, W. V. BLEWETT (*So. African Sugar Jour., 11 (1927), No. 4, pp. 251, 253, 255, 257*).—Figures based on an assumed yield of 30 tons of cane per acre are quoted as showing that Natal sugar cane tops and trash contain, per acre, in the neighborhood of 49 lbs. of nitrogen, 10 lbs. of phosphoric anhydride, and 110 lbs. of potash as oxide, together with 48 lbs. of sulfuric anhydride. Bagasse contains less plant food elements, but there is some nitrogen worth preserving and a large portion of its potash is lost when

the bagasse is used as fuel. Press cake from 80 tons of the cane is reported as containing probably about 18 lbs. of nitrogen and 23 lbs. of phosphoric anhydride. The obvious waste of nitrogen and probably of other plant foods in burning these substances is noted, and such possibilities as the use of trash for bedding or litter for animals with subsequent return to the soil, or the direct return of the trash either to rot on the ground or to be buried for the purpose of increasing the rate of decay, are discussed.

Analyses of commercial fertilizers, season 1926–1927, R. N. Brackett and D. H. Henry (*South Carolina Sta. Bul. 241 (1927), pp. 63*).—The customary analyses required by the State law on 1,348 official samples of commercial fertilizers are tabulated and the usual supplementary information given.

AGRICULTURAL BOTANY

[Carnegie Institution of Washington] laboratory for plant physiology, D. T. MacDougal et al. (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 151–184, figs. 2*).—Some details of the work of the year, partly continuing that previously noted (E. S. R., 55, p. 627), appear below.

The age of endurance of living cells, T. D. MacDougal (p. 152).—Studies carried on for several years have shown the importance of determining the length of time during which cells may grow and carry on the major protoplasmic functions. Artificial cells constructed chiefly to measure the passage of colloidal layers, similar to those of the living cell, by ions "run down" within 72 hours. Some detailed experimental tests have been carried out on the action and properties of the medullary cells of the trunk of the giant cactus, which may have a life nearly as long as that of the tree, and some of which may be converted to wood cells after having attained great age.

Changes in anatomy, composition, and permeability of cells that live long, D. T. MacDougal (pp. 152, 153).—In the medulla of a tree cactus (Carnegiea) it is possible to have large masses of cells from the same individual with which varied comparisons may be made, and the successive stages in growth, developmental changes, and cell reactions may be determined. Some of the changes are indicated, including increase of glucose in the sap, decrease of mucilages or pentosans, and a thickening of the cell wall suggestive of direct conversion of carbohydrates.

The hydrostatic system of trees, D. T. MacDougal (pp. 153–155).—It has become possible to make some additions to the conception previously noted (E. S. R., 56, p. 725); also to define important differences between the hydrostatics of the coniferous stem (pine and redwood) and the stems of such trees as oak, walnut, and willow. Further differentiations among these dicotyledonous types have also been recognized. The progress of these studies confirms increasingly the conclusions of Dixon as to the presence of a cohesive column of water in tree trunks terminating in the ultramicroscopic menisci in the walls of the transpiring cells in the leaves, and extending to the roots and even into the soil. The most positive evidence has been obtained that living cells in the wood may have no positive share in conduction of materials. Connections of the intercellular spaces of the cortex with those of the medullary rays leading to the interior of the stem, if present, are not of such total capacity as to be of physiological importance to the plant. The path of the upwardly moving sap stream lies chiefly in the annually formed layers which are connected with the leaves. Conduction takes place in the three or more external layers of the pine trunk. Sap likewise passes up chiefly through the autumnal wood of the walnut in the three outermost layers. In the willow conduction is found in the autumnal wood of layers formed 10 to 12 years previously.

Some methods for determining the tissues concerned and the path of transfer of solutes in plants, J. B. Overton, (p. 155).—Preliminary experiments using anhydrous sodium tellurite of the highest purity in solutions of strengths of 0.00007 to 0.00017 M, none of which were toxic to sunflower or to *Malva borealis*, seemed to indicate that this salt follows the course of the transpiration stream in the xylem from the roots to the leaves, and that lateral diffusion occurs from the vessels into certain other tissues.

Stem anatomy and sap conduction, J. B. Overton (pp. 155–158).—The experiments show that in such trees as *Juglans major*, *J. californica*, and *Salix lasiolepis*, in such shrubs as Jatropha, and in sunflower plants conduction of dyes like acid fuchsin goes on strictly in the xylem, also that differences in age, amount, and position of the wood affect its conducting capacity. Differences, variations, and the effects of age and of tyloses are indicated for various plants. The contention that the function of the living cells accompanying the conducting tracts is to keep the lumina in a proper state of conductivity seems to be disproved by these experiments. The distribution of acid fuchsin after treatment with the poison is exactly that described for the unpoisoned wood, except that there is more lateral diffusion in the poisoned medullary rays and wood parenchyma. "These experiments lead to the conclusion that neither the living medullary rays nor the living wood parenchyma cells play a part in conduction in these trees."

Intercommunication of pits and vessels, J. B. Overton (pp. 158, 159).—By the use of Chinese ink finely ground and centrifuged to remove all but the smallest particles, it has been possible to show that such particles can be forced to travel up a freshly cut pine stem 20 to 30 mm., or many times the length of a tracheid. This leads to the conclusion that the particles actually pass through the perforations in the membrane from one tracheid to another. This may be verified by microscopical examination. Variations of this experiment are mentioned. Experiments thus far do not demonstrate with walnut or willow the passage of even the finest particles of carbon beyond the length of a vessel.

The distribution of gas in trunks of trees as determined by anatomical features, J. B. Overton (p. 160).—As pointed out previously by MacDougal (E. S. R., 56, p. 725), gases taken from the central portions of *Quercus agrifolia*, *Pinus radiata*, and *Juglans major* in autumn are in proportions widely different from those of the surrounding atmosphere. These proportions vary at other seasons. The amount of dissolved gas depends among other things upon the tension, pressure, and temperature of the water in the vessels. The free carbon dioxide also varies with these factors. It is therefore regarded as evident that the gas pressures within the plant depend upon the number and activity of living cells in producing carbon dioxide, upon the pressure and tension of the water in the vessels, and upon the temperatures of the water. Experiments on oak, pine, willow, and walnut trees lend no support to any form of gas-pressure theory of sap flow.

Composition of gases in tree trunks, D. T. MacDougal (pp. 160–162).—Determinations of the composition of the included gases were made on wood late in the season of 1925. Samples were extracted from radial bores by means of a mercury column set to give suctions of 0.6 to 0.8 atmospheres, and the pressures are tabulated of oxygen, of carbon dioxide, and of nitrogen with possibly other gases.

Exudation and "root pressures," J. B. Overton (pp. 162–165).—To the results of former studies (E. S. R., 53, p. 624; 56, p. 725), data have been added including record of much higher pressures in coniferous stems in case of such plants as the Monterey pine. Exudation pressures of small trees, potted plants in

the greenhouse, or of large roots of this species are apparently not directly connected with the activity of the endodermal mechanism or with the transpiration stream. No experimental evidence has been obtained to show that in *Pinus radiata*, *Juglans major*, *Salix lasiolepis*, or *Quercus agrifolia* any osmotic action of the root is sufficient to force water up a stem. In small herbaceous plants, such as sunflower, *Encelia farinosa*, and *Malva borealis*, the pressures may perhaps be attributable to the action of the endodermal mechanism, and the force may be sufficient to supply the stem with water in the absence of transpiration. Differences noted are discussed in connection with probable factors.

"It seems apparent that suction pressures brought about by transpiration can in some, but not all, cases be changed to positive pressures by defoliation, or that the negative pressures can at least be reduced. It is, therefore, evident that factors other than the tension of the cohesive water columns brought about by transpiration and expansion of the inclosed gas body are operative in causing negative pressures."

Exudation or positive pressure and "negative pressure" or suction in tree trunks, D. T. MacDougal (p. 165).—The older wood of the pine trees studied seems to contain gases at less than atmospheric pressure at all times. The most prominent feature of sap tension in trunks not explainable by changes in gas pressure is the partial or almost complete filling up of the wood with water at the end of the season or when the tree is in an autumnal condition. The living parenchyma of the walnut, both in trunk and in roots offers possible sources of the implied action, supposedly continuous throughout the season. Such positive pressure may be found in bores driven in the outer layers of *Salix lasiolepis* during the midsummer season of slackened growth, at a time when only suction is found in radial bores and at the ends of stumps of branches and roots. Dendographic records show that accelerated growth occurs later with the formation of a second recognizable layer during the year.

Further studies in suction tension, V. Úlehla (pp. 166, 167).—Previous work (E. S. R., 55, p. 628) has shown that suction tension (this term having been adopted in preference to that of suction force) in the medulla of Carnegiea and of Opuntia changes in an opposite manner as the time elapses. Further investigations have shown that similar differences exist between tissues of a species. An account is given of suction tension in *C. gigantea*, *Postelsia palmaeformis*, and in mesophytes. The statement made in case of desert succulents, that the suction tension does not express an equilibrium but a rate, appears to be of wide application.

The significance of the water deficit in living cells, V. Úlehla (pp. 167–169).—Studies were made on living pith of *Opuntia phaeacantha*, *Carnegiea gigantea*, *Sinapis alba*, *Solidago virgaurea*, *Crambe tartaria*, *Rheum undulatum*, *Nymphaea* sp., *Amaryllis* sp., and *Postelsia palmaeformis*. It is concluded that a certain degree of water deficit appears to be a fundamental condition of life in all cases studied. This fact should be considered in efforts for establishing cultures of plant tissues and in microscopical work with living plant cells. It is thought advisable to replace water as culture or observation medium with a weak solution of sucrose. As regards reasons for death from saturation a working hypothesis has been proposed to the effect that the speed of oxygen supply, and consequently the respiratory activity of the cell, depends closely upon the amount of the water deficit. Changes in permeability, in viscosity, and in similar properties are, in this hypothesis, looked upon as mere accessory phenomena of such fundamental life processes as hydration and respiration.

Anomalous osmosis in living cells, V. Úlehla (pp. 169, 170).—"On the basis of facts bearing on the dynamic character, the specificity, and the never-failing presence of suction tension, circulating interchange of water between living cells can be understood. But in the case of submersed plants it would seem that a dynamic equilibrium would ensue. In a joint research with Professor Lloyd, the arrangement in Postelsia by which the equilibrium is prevented was found."

It is claimed to have been shown for the first time that anomalous osmosis occurs in a living plant cell.

Relation of distention of cells to acidity of solutions, V. Úlehla (p. 170).—In a study of the pH of the cell surfaces as related to distention in water, two maxima of action where found in most cases between which a point of minimum action is located, usually about pH 6, and this is considered the point of physiological neutrality.

The influence of electrolytes on the swelling of agar, B. K. Clarke (pp. 170-173).—In an attempt to correlate some of the known physical or chemical properties of the alkali metals or of solutions of their salts with their effect on the swelling of agar, auxographic results showing irregularities are noted. The Hofmeister or lyotropic series is not a constant thing like the atomic-number series, but depends upon concentration. A careful study was made of the H-ion concentration changes in the potassium chloride series, and the results are tabulated with suggestions.

Diffusion with chemical transformation.—A contribution on the chemical analysis of biological and periodically varied reactions, V. Moravek (pp. 173-175).—It is regarded as a safe conclusion that the behavior of every kind of cell is specific. Use is made of experiments on collodion membranes, agar-agar, and gelatin.

"Diffusion, which brings about a chemical transformation in gel, depends in its progress on the structure of the gel and the concentration of the reacting ions."

Preparation of i-glyceric aldehyde, H. A. Spoehr and W. G. Young (pp. 175-177).—Synthesis was made through the following steps, which are reported upon in detail: The preparation of β-chlorpropionic aldehyde diethyl acetal from acrolein; the conversion of β-chlorpropionic aldehyde diethyl acetal into acrolein diethyl acetal; the preparation of glyceric aldehyde diethyl acetal from acrolein diethyl acetal by a procedure specified; and glyceric aldehyde from glyceric aldehyde diethyl acetal.

Absorption of carbon dioxide by leaf material, H. A. Spoehr and W. Newton (pp. 177-180).—Investigations of the capacity of dried and powdered leaf material to absorb carbon dioxide (E. S. R., 55, p. 628) were extended to include (besides sunflower) nettle, spinach, hydrangea, turnip, alfalfa, rhubarb, grass, and *Ramilina reticulata*. Only sunflower and nettle leaf material gave positive results. It appeared that the larger part of the absorption of carbon dioxide by *Helianthus annuus* dried leaf material and the alcoholic precipitates obtained therefrom could be ascribed to bicarbonate formation.

"The sunflower and nettle material is noteworthy because both the dried leaf material and the alcoholic precipitates absorb more carbon dioxide than can be accounted for by the solubility of this gas in the water added to the dried or precipitated material. . . . There is, however, no direct relation between the absorption capacity and the amount of ash in the leaves and alcoholic precipitates."

The daily course and the specific intensity of photosynthesis in water plants [trans. title], S. Kostytschew and S. Soldatenkow (*Ztschr. Wiss. Biol., Abt. E., Planta, Arch. Wiss. Bot., 2 (1926), No. 1, pp. 1-9, figs. 4*).—This work relates chiefly to the changes in photosynthetic activity in algae.

Metabolism of nitrogen compounds in dormant and nondormant potato tubers, W. NEWTON (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 141–146, figs. 2*).—In a previous publication (E. S. R., 50, p. 326) the author indicated that nitrates might stimulate the growth of dormant tubers to a greater extent than in nondormant ones, and the stimulation was believed to be due to a deficiency of soluble nitrogen in the tubers. Later investigations show that the stimulation of growth by nitrates may not be due to an internal deficiency of soluble nitrogen compounds in dormant tubers that can be offset by the absorption of nitrate.

The absorption of nitrates by potato tuber tissue was found to shorten the dormant period, but under the same conditions ammonium salts did not affect it. There appeared to be a tendency for the amino and amide nitrogen to be greater in nondormant than in dormant tubers, but growth was not directly dependent upon the actual concentration of either of these compounds. Proteolytic enzyme activity was more intense in the expressed juice of nondormant than in dormant tubers. Evidence was obtained which indicated that when potato juice was incubated amino acid nitrogen was converted into amide nitrogen. The addition of asparagine to dormant tuber juice activated the carbohydrate hydrolytic enzymes, but had no apparent influence upon nondormant tuber juice.

Recent studies on bleeding and exuded sap of deciduous trees [trans. title], K. RICHTER (*Mitt. Sächs. Forstl. Versuchsanst. Tharandt, 2 (1925), No. 4, pp. 157–184, figs. 10*).—This is a University of Giessen thesis.

Studies on roots, W. A. CANNON (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 317–325*).—Notes are given on the variation in oxygen content of the soil of cultures, with results of experiments on *Geranium* sp., *Gossypium hirsutum*, and *Vicia faba;* also, on the root system of *Sequoia sempervirens;* on the absence of root hairs in the redwood; on the method of observing roots in outdoor cultures; on winter rains and soil temperature in California; on root growth, soil temperature, and other factors; and on atmometry in South Africa.

The etiology of variegation [trans. title], E. KÜSTER (*Ztschr. Pflanzenkrank. u. Pflanzenschutz, 36 (1926), No. 5–6, pp. 129–142*).—This purports to be a critical review of literature on variegation in plants, which is cited.

[Carnegie Institution of Washington studies on] ecology, F. E. CLEMENTS (*Carnegie Inst. Wash. Yearbook 25 (1925–26), pp. 335–371, fig. 1*).—The work of the year has included experimentation at the Alpine Laboratory in Colorado, and study or observation at Santa Barbara and Berkeley, Calif., at Lincoln, Nebr., and at the Desert Laboratory, besides other points. Some of the studies are outlined or detailed under the subjects: Adaptation, by F. E. Clements, C. W. Penland, and C. Whitfield (pp. 336, 337); Fixation, by F. E. Clements (pp. 338, 339); Experimental Morphogeny, by F. E. and E. S. Clements and F. C. Bowman (pp. 339, 340); Hybridization in Nature, by F. E. Clements and C. W. Penland (pp. 341, 342); Experimental Phylogeny, by F. E. and E. S. Clements (pp. 342, 343); Phylogeny of Haplopappus, by H. M. Hall (pp. 343–345); Experimental Taxonomy, by H. M. Hall et al. (pp. 345, 346); Phytometry in the Knysna Forests, by J. Phillips (pp. 346, 347); Studies in Aeration, by G. W. Goldsmith and F. E. Clements (pp. 347, 348); Soil Factors in California Grassland, by A. G. Vestal (pp. 348–350); Climatic Cycles and Tree Growth, by A. E. Douglass (pp. 350–352); Ecological Measurement of Photosynthate, by F. L. Long, F. E. Clements, and C. R. Haupt (pp. 352–354); Factors Involved in Opening and Closing Flowers, by G. W. Goldsmith, F. E. Clements, and A. L. Hafenrichter (pp. 354, 355);

Nature and Rôle of Competition, by F. E. Clements, J. E. Weaver, and H. C. Hanson (pp. 355–358); Coastal Prairie (Stipa-Andropogon Association), by F. E. Clements and B. C. Tharp (pp. 358, 359); Nature and Relations of Savannah in Texas, by B. C. Tharp and F. E. Clements (pp. 359, 360); Plant Association of Tamaulipas, Mexico, by B. C. Tharp (pp. 361, 362); The Maritime Grassland of Middle California, by F. E. Clements and A. G. Vestal (pp. 362, 363); A Southern Upland Grass-sedge Bog, by B. W. Wells and I. V. Shunk (pp. 363–365); Succession and Climaxes in the Knysna Region, by J. Phillips (pp. 365–367); Animal Relations in the Terrestrial Biome, by V. E. Shelford (pp. 367, 368); Rodent Damage on Arizona Ranges, by W. P. Taylor (pp. 368, 369); Habits and Reactions of Scaphiopus hammondi, by G. W. Goldsmith (pp. 369, 370); and Principles and Methods in Paleo-ecology, by F. E. Clements and R. W. Chaney; together with research in economic plants (p. 371).

Occurrence of Mycorrhiza in Iowa forest plants, M. L. Lohman (*Iowa Univ. Studies Nat. Hist., 11 (1926), No. 10, pp. 33–58, pls. 8*).—The 70 individual plants collected and examined from typical forested areas of Johnson, Iowa, and Dickinson Counties represented 21 families, 34 genera, and 40 species, 16 being Pteridophytes (4 families, 8 genera, and 9 species), and all others being higher plants. Regarding the occurrences of associations and other features, a compact summary is given.

Preliminary list of the Uredinales of Washington, J. W. Hotson (*Wash. Univ. [Seattle], Puget Sound Biol. Sta. Pubs., 4 (1925), pp. 273–391; abs. in Phytopathology, 15 (1925), No. 2, p. 126*).—This is an attempt to bring together the known rusts of Washington, completing in a general way the lists for the Pacific coast, and said to be based on study of more than 2,000 collections distributed among 224 species. Rust genera are listed alphabetically, with annotations, under families, species, likewise under genera. Keys to families and genera are furnished. The nomenclature of the host plants is that employed by Piper and Beattie in the Flora of Southeastern Washington and Adjacent Idaho and The Flora of the Northwest Coast (E. S. R., 31, p. 731; 34, p. 336).

Handbook of fermentation bacteriology.—II, Special fungi, W. Henneberg (*Handbuch der Gärungsbakteriologie.—II, Spezielle Pilzkunde. Berlin: Paul Parey, 1926, vol. 2, 2. ed., rev. and enl., pp. XII+403, figs. 178*).—The second volume of the second edition of this handbook, dealing with the special groups of fungi, is divided into three sections which take up, respectively, the yeasts, first in general view, then in the subgroups of cultivated and wild yeasts; the fission fungi or bacteria proper in a series of detailed accounts of groups and individual types important in fermentation studies; and in the third section the mold fungi in so far as they fall within the bounds limiting the above indicated treatment of the bacteria. An appendix, also in three sections, deals with (1) animal pests of the grains and fermentation industries, such as certain of the beetles, moths, mites, flies, and worms; (2) the practical and economic aspects of some fermentation processes; and (3) the literature of the subjects considered in the text and appendix.

GENETICS

The physiological theory of heredity, R. Goldschmidt (*Physiologische Theorie der Vererbung. Berlin: Julius Springer, 1927, pp. VI+247, figs. 59*).—The theory of inheritance based on the physiological action of genes, which the author is largely responsible for developing, is clearly set forth. A large

part of the evidence is based on the results of experiments w[illegible] *mantria dispar*, particularly those referring to the author's studies of inte[illegible]xuality.

Variability and variation, J. PHILIPTSCHENKO (*Variabilität und Variation. Berlin: Borntraeger Bros., 1927, pp. [5]+101, figs. 4*).—A discussion of the variability of certain characters with reference to the influence of different kinds of variability in evolution.

A mathematical theory of natural and artificial selection.—Part V: Selection and mutation, J. B. S. HALDANE (*Cambridge Phil. Soc. Proc., 23 (1927), No. 7, pp. 838–844*).—Theoretical formulas have been derived to indicate the possibility of survival of dominant and recessive mutations under different degrees of selection.

Is there a spermatozoa dimorphism in domestic cattle? A chromosome study and a contribution to the criticism of the chromosome science [trans. title], H. F. KRALLINGER (*Züchtungskunde, 2 (1927), No. 3, pp. 131–139, figs. 2*).—Studies of the chromosomes in the germinal tissue of bulls indicated that the diploid number is approximately 60. The sperms varied in head length from 5 to 8μ, but a dimorphism in the size of the sperms was not established though measurements made of sperms from the central portion of the testicles showed them to be larger than those measured at the periphery. The difference is explained as due to the time required for the penetration of the fixing solutions. If there is a difference in the type or character of the spermatazoa produced determining sex, this difference can not be detected in measurements, and for the purpose of separation of the two types dependence must rest on physico-chemical means.

The chromosomes of the Indian runner duck, O. S. WERNER (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 5, pp. 330–372, pls. 10*).—Chromosome studies of somatic and germinal tissue in 7 male and 6 female Indian runner duck embryos indicate that the diploid number for males is 76 and for females 77. The cells of the females showed the presence of a long unpaired chromosome not found in male cells. In the primary spermatocytes of the male there were 38 bivalent chromosomes. Other observations indicated that sutures accompanied by constrictions were rather constant in position in at least two points in the largest rod-shaped chromosomes, which lend pliancy to these regions. Gonomeric grouping of chromosomes was observed in the amnion cells of the duck and was thought to be present in the chromosome plates of the gonial cells in the embryo of the chick and lizard. Certain of the smaller chromosomes appeared to be connected by filaments in certain stages of the prophase. In regard to the mechanism of sex determination it is concluded that the duck is similar to the moth Phragmatobia in that it is of the WwZ–ZZ type, giving the females more chromatin than the males and thus preserving female digamety.

The chromosome constitution of Gates' "non-disjunction" (v–o) mice, T. S. PAINTER (*Genetics, 12 (1927), No. 4, pp. 379–392, pls. 3*).—Chromosome studies, of mice from the strain which Gates (E. S. R., 55, p. 821) assumed to lack one chromosome or a portion of one, showed that the normal number (40) were present in the germ cells, but that one chromosome was smaller than in either the normal mouse or normal waltzers. This fragment united in synapsis with the *q* chromosome, and it is therefore concluded that a portion of this chromosome was lost, confirming one of Gates' hypotheses advanced on the basis of the results of breeding experiments.

The functional inter-relation of certain genes in the development of the mouse, C. H. DANFORTH and S. B. DE ABERLE (*Genetics, 12 (1927), No. 4, pp. 340–347*).—The results of tests are presented showing that though various com-

binations of genes influence the color of mice carrying the A^y gene (yellow), they do not affect its lethal action or its influence on obesity (E. S. R., 57, p. 721). Similar results were also obtained in other experiments with the gene W (dominant spotting), which has a lethal action resulting from severe anemia when homozygous. From this it is concluded "that genes which *modify each other's effects do so indirectly and not through direct mutual* interaction."

Rodless retina, an ophthalmic mutation in the house mouse, Mus musculus, C. E. KEELER (*Jour. Expt. Zool., 46 (1927), No. 4, pp. 355–407, figs. 18*).—A more detailed acount of the investigation previously noted (E. S. R., 56, p. 129).

Morphology and course of hair: Contribution to the science of anomalies and abnormalities [trans. title], T. NIEDOBA (*Ztschr. Tierzüchtung u. Züchtungsbiol., 6 (1926), No. 1, pp. 113–187, figs. 11*).—The author has studied the course of hair and hair swirls on various monstrosities in cattle, horses, and dogs, from which he concludes that a fundamental relation exists between morphological abnormalities and irregularities in the swirls and course of the hair.

Forest genetics, with particular reference to disease resistance, C. HARTLEY (*Jour. Forestry, 25 (1927), No. 6, pp. 667–686*).—Believing that hybridization of forest species should yield valuable results in securing the benefits of both hybrid vigor (heterosis) and greater disease resistance, the author lists several species known to have arisen by hybridization and also some of the characters in which differences between individual trees of the same species have been reported as apparently hereditary. While forest tree species are known to vary less than many cultivated plants, there is much evidence of heterozygosity. Various forest problems needing study from a genetic standpoint are suggested.

Experiments on Chrysanthemum sinense Sabin. var. spontaneum Mak., S. NOHARA (*Bot. Mag. [Tokyo], 41 (1927), No. 483, pp. 129–141, figs. 8*).—Attempts to induce changes in the number and length of the petals of a wild species of chrysanthemum by growing the plants in soils of different fertility failed to yield significant results. A very slight positive correlation was determined between the number and the length of the petals.

***The segregation of carbohydrates in crosses between waxy and starchy* types of maize,** T. A. KIESSELBACH and N. F. PETERSEN (*Genetics, 11 (1926), No. 5, pp. 407–422, fig. 1*).—The Mendelian segregation of waxy and starchy carbohydrates in the sporophytic and gametophytic generations was studied at the Nebraska Experiment Station in hybrids of Chinese waxy with dent and flint corn. The waxy endosperm character behaves as a simple recessive in crosses with starchy corn. Explanations are cited for the slight deficiency of waxy kernels observed in those combinations where segregating pollen has been used.

On the genetics and cytology of fatuoid or false wild oats, C. L. HUSKINS (*Jour. Genetics, 18 (1927), No. 3, pp. 315–364, pls. 3, figs. 50*).—Extended investigations (E. S. R., 57, p. 826) were concerned with the genetic and cytological behavior of strains of four types of fatuoids and miscellaneous fatuoids. The bibliography is amplified, and chromosome counts are given for 12 species of Avena.

The evidence suggested that fatuoids arise from normal oats by chromosome aberration. The close analogy between fatuoids and speltoids is demonstrated, with an attempt to correlate data from these forms with that from hybridization studies in wheat and oats. The genetic constitution of various species of

wheat and oats is commented on. Segregation ratios resulting from whole chromosome differences are shown to simulate those from gene differences, although more variable. The importance of correlating cytological studies with genetics in cases where dwarf types appear in irregular or unexpected ratios seemed evident from the aberrant cytological conditions found in dwarf oats. A possibility of producing commercially valuable varieties of oats which will not give rise to fatuoids was apparent.

Recent genetic investigations with rice [trans. title], Y. Yamaguchi (*Ztschr. Induktive Abstam. u. Vererbungslehre, 45 (1927), No. 1-2, pp. 105-122, figs. 4*).—Inheritance studies with rice, largely Japanese, are reviewed under the topics of quantitative characters, time of blooming, disease resistance, endosperm character, coloration, sterility, variegated leaves, factor index, and linkage groups.

Inheritance studies in soybeans.—I, Cotyledon color, F. V. Owen (*Genetics, 12 (1927), No. 5, pp. 441-448*).—Duplicate factors, D_1 and D_2, described from studies at the Wisconsin Experiment Station, seemed responsible for yellow cotyledons in soy beans. D_1 is linked with G, the factor of Nagai (E. S. R., 49, p. 26) for green seed-coat color, with a crossover value of about 13 per cent. These findings apparently confirm C. M. Woodworth's[4] observations, and D_1 and D_2 were identified in several varieties of soy beans.

Dwarfs in soybeans, R. T. Stewart (*Jour. Heredity, 18 (1927), No. 6, pp. 281-284, figs. 2*).—A new type of soy bean dwarf isolated at Iowa State College is a small pubescent light green plant with only one or two short branches and which produces few pods or seed. Inheritance data show this dwarf character to be recessive to the normal and probably due to a single factor pair.

Genetic and cytological studies in wheat, III, A. E. Watkins (*Jour. Genetics, 18 (1927), No. 3, pp. 375-396, pls. 2, figs. 8*).—A preliminary account is given of the genetics of crosses between *Triticum turgidum* with 14 chromosomes (haploid) and *T. vulgare* with 21, the cytology of which has been described earlier (E. S. R., 54, p. 223). In crosses between wheat species of the second (28 chromosome) and third (42 chromosome) groups, and in certain back crosses described, grain germination seemed largely determined by the chromosome constitution of the endosperm. Germination is good if the extra *vulgare* chromosomes are all diploid or triploid in the endosperm and bad if some of them are only present in the haploid condition.

The development of pollen grains from microspores, in the partially sterile *T. vulgare* × *T. turgidum* F_1, is described. Counts confirmed an earlier conclusion that the fully fertile F_1 egg cells mostly have a chromosome number intermediate between 14 and 21; and that in the F_1 pollen sterility falls most heavily on the pollen grains with intermediate chromosome numbers and greatly increases the chance that fertilization will be effected by those with the parental numbers. Considering characters differentiating the species, it was found that 14-chromosome pollen carries mainly *turgidum* characters, and 17- to 21-chromosome pollen mainly *vulgare* characters, whereas the egg cells tend on the whole to be genetically intermediate.

The cytology of species hybrids in wheat, W. P. Thompson (*Sci. Agr., 8 (1927), No. 1, pp. 56-62, figs. 4*).—Recent cytological studies reviewed were concerned with pure species of Triticum; hybrids between 14- and 21-chromosome, 14- and 7-chromosome, and 21- and 7-chromosome species; hybrids between common wheat and rye; and later generations of hybrids between 21- and 14-chromosome species.

Multiple factors and multiple allelomorphs in the inheritance of milk production [trans. title], H. NACHTSHEIM (*Ztschr. Tierzüchtung u. Züchtungsbiol.*, *6* (*1926*), *No. 1*, *pp. 129–136*).—A discussion of the possible complexity of the factors affecting the inheritance of the capacity for milk production, based on the influence of various genes not directly on milk production but indirectly through their influence on glands, organs, and other anatomical parts which have a bearing on milk production.

Segregation or intermediate? Contributions to the determination of the mode of inheritance of fineness of wool [trans. title], C. KRONACHER and W. SCHÄPER (*Ztschr. Tierzüchtung u. Züchtungsbiol.*, *6* (*1926*), *No. 1*, *pp. 59–80*, *figs. 7*).—Studies of the fineness of wool among the offspring of several generations from a Merino-Leicester cross furnished evidence for the segregation of the characters, while other cases indicated an intermediate type of inheritance probably due to the fact that large numbers of factors evidently influence the fineness of wool. The older ewes generally had finer wool than the younger animals, and there was no significant relationship between the live weight of the animals and the fineness of the fibers. The merits of the different methods of measuring the qualities of the fibers were also compared.

Some observations on the meiosis of the pollen mother cells of Carica papaya, Myrica rubra, Aucuba japonica, and Beta vulgaris, T. SUGIURA (*Bot. Mag.* [*Tokyo*], *41* (*1927*), *No. 483*, *pp. 219–224*, *pl. 1*, *fig. 1*).—Studies at the Tokyo Imperial University showed 9, 16, 8, and 9 haploid chromosomes, respectively, for *C. papaya*, *A. japonica*, *M. rubra*, and *B. vulgaris*. End to end connection of univalent chromosomes was observed in the prophase of the pollen mother cells of all four species. No sex chromosomes were found in the male of the first three species, all dioecious plants. In the beet nucleolar budding was observed in the heterotypic prophase of the pollen mother cells.

The occurrence of semi-sterility in maize, R. A. BRINK (*Jour. Heredity*, *18* (*1927*), *No. 6*, *pp. 266–270*, *figs. 2*).—Corn plants exhibiting a condition in which the proportion of aborted pollen grains approximated 50 per cent appeared in two progenies of a selfed plant heterozygous for the sugary and waxy genes in a study at the Wisconsin Experiment Station. The phenomenon recurs among the offspring of defective pollen producers and evidently is genetic. The breeding relationships and the possible origin of the semisterile condition are discussed briefly.

Micro and macrosporogenesis in sugar beet, with special reference to the problem of incompatibility, E. ARTSCHWAGER (*Mem. Hort. Soc. New York*, *3* (*1927*), *pp. 295–297*).—A brief summary of the development of the pollen mother cell and embryo sac, emphasizing points bearing on the incompatibility problem.

Manifestations of impotence in a plant propagated by seed, D. F. JONES (*Mem. Hort. Soc. New York*, *3* (*1927*), *pp. 299–303*, *pls. 2*, *figs. 4*).—Sterility in corn described in this contribution from the Connecticut State Experiment Station embraces a factor sterilizing both male and female floral organs, genes causing corn plants to become wholly pistillate either in structure or function, and sterile tassels (pollen abortion), and two caused by both environmental and genetic factors, e. g. plants with only terminal inflorescences and earless plants.

Sterility of pollen in Datura, A. F. BLAKESLEE and J. L. CARTLEDGE (*Mem. Hort. Soc. New York*, *3* (*1927*), *pp. 305–312*, *pl. 1*, *fig. 1*).—Aborted grains in pollen of 1*n*, 2*n*, 3*n*, and 4*n* plants of Datura (E. S. R., 56, p. 127; 57, p. 519) are caused probably chiefly through chromosomal deficiencies. Primary (2*n*+1) types gave more unrelated nondisjunctional forms in their offspring

that did normal $2n$ parents. The higher percentage of nondisjunction in primaries seemed responsible for the higher percentage of bad pollen in primaries in comparison with diploids. Secondary $(2n+2/2)$ types are believed to produce a proportion of bad grains, corresponding to the number of primaries which they throw in their offspring.

The cause of the 50 per cent abortion of pollen grains and ovules found in F_1s betwen most of the lines studied and certain "bad pollen producers" which themselves have good pollen was apparently located in two chromosomes (Echinus and Microcarpic). Another type of bad pollen producers gave 25 per cent of pollen abortion in F_1s with Line 1 for which two other chromosomes seem responsible. Segmental interchange between nonhomologous chromosomes, which was suggested as explanation of "*B*" whites, may be a cause of bad pollen producers. Low temperatures may cause abortion of pollen grains and an increase in size of grains, due presumably to abnormalities in chromosome number.

The genetics and physiology of self-sterility in Nicotiana, E. M. East and A. J. Mangelsdorf (*Mem. Hort. Soc. New York, 3 (1927), pp. 321-323*).—The theory discussed herein has been noted from another source (E. S. R., 55, p. 27).

Inherited pollen-sterility in shepherd's purse, G. H. Shull (*Mem. Hort. Soc. New York, 3 (1927), pp. 353-368, pl. 1, figs. 4*).—Pollen sterility was observed in shepherd's purse in ratios suggesting that it is a Mendelian recessive to pollen fertility. The results are often obscured or distorted by the simultaneous occurrence of another type of sterility induced by unfavorable environmental conditions. The factor for pollen sterility is apparently sometimes duplicated. In one series of families the pollen sterility factor seems to be closely linked with a factor producing a low grade rhomboidea-like lobing of the leaves which has been designated "subrhomboidea." The relationship between this and pollen sterility is such that when both are segregating simultaneously only the subrhomboidea group usually splits into pollen-fertile and pollen-sterile classes, while the simplex group shows pollen sterility seldom if at all. Subrhomboidea is evidently either itself lethal in the homozgous state or is closely linked with a recessive lethal.

The specificity of sex, of organization, and of differentiation of embryonic chick gonads as shown by grafting experiments, B. H. Willier (*Jour. Expt. Zool., 46 (1927), No. 4, pp. 409-465, figs. 27*).—A more detailed account of investigations previously noted (E. S. R., 55, p. 830).

The low sex ratio in negro births and its probable explanation, S. J. Holmes (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 5, pp. 325-329*).—Data are presented which indicate that the lower sex ratio of negroes as compared with whites is due to the fact that stillbirths and infants which die are not as completely reported for census purposes as in case of the whites. The heavier prenatal and infant mortality of the males thus makes the sex ratio of negroes appear lower than it should be.

Further evidence concerning the menstrual cycle of the monkey, Macacus rhesus, E. Allen (*Anat. Rec., 35 (1927), No. 1, pp. 1, 2*).—In an abstract of the results of investigations at the University of Missouri in which histological studies were made of the genital tissues from normal and ovariectomized control and experimental animals having menstrual cycles induced by injections of ovarian and placental hormones, it was concluded that the follicle is the seat of production of the essential hormone in the mechanism of the cycle, but the human placenta also contains a similar substance. Endocrine activity of the corpus luteum was not a necessary factor. After a certain amount of

growth in the genital organs is induced by the administration of the hormone, its withdrawal or decrease precedes menstruation.

A quantitative study of follicular atresia in the mouse, E. T. Engle (*Amer. Jour. Anat.*, *39* (*1927*), *No. 2*, *pp. 187–203*, *figs. 2*).—The results are reported of studies conducted at Stanford University dealing with the numbers of degenerating ova and follicles found in 60 ovaries removed from mice at different stages of the oestrous cycle as determined by the vaginal smear, and in 50 ovaries removed from females during the first 4½ days of pregnancy. The data for each ovary are tabulated showing the number of tubal ova and the atresic follicles, together with a classification as to their stage of development and the characteristics of the degeneration. In the ovaries from nonpregnant females the number of atresic follicles ranged as follows, per ovary, during the different stages of the cycle: Cornified cell stage, 36 to 85, with median at 59; first day following disappearance of cornified cells, 50 to 129, with median at 71; second day of leucocytes and small nucleated epithelial cells, 29 to 63, with median at 36; and the stage prior to the first appearance of cornified cells and following the disappearance of leucocytes, 16 to 70, with median at 39. There thus appeared to be a distinct periodic variation in the amount of follicular atresia.

The numbers of atresic follicles were not so numerous in the ovaries from pregnant females, ranging from 7 to 41, and when grouped according to the stage of development of the tubal ova they did not show a periodic divergence. However, a few ovaries from females toward the end of gestation showed an amount of atresia comparable to that found in nonpregnant animals immediately preceding ovulation.

Among the ovaries studied there were 72 taken from 36 animals. The correlation between the amount of atresia in the two ovaries from the same animals was 0.963±0.008. There was little indication of a relationship between the number of tubal ova and the amount of atresia in the associated ovary.

Differences in the growth curves of albino rats born during the four seasons of the year under uniform laboratory conditions, F. B. Hanson and F. Heys (*Anat. Rec.*, *35* (*1927*), *No. 2*, *pp. 83–89*, *figs. 2*).—Data on the weights of rats born in the four seasons of the year are given for sex and age in 20-day intervals up to 100 days. Previous results showed that the differences in birth weights and 20-day weights for individuals born in the different seasons were not significant for either sex. The data presented, however, show that after 40 days females born in September, October, or November had the greatest mean weights and those born in June, July, or August the smallest mean weights. The same was generally true for males, with two exceptions, though some of the differences for the males were hardly significant. The largest coefficient of variation in the weights was observed in both sexes for those born in the summer months and the smallest coefficients for those born in the fall. The amount of variability generally decreased with age.

FIELD CROPS

Handbook of cereal culture, J. Becker (*Handbuch des Getreidebaues. Berlin: Paul Parey, 1927, pp. XX+627, figs. 94*).—This volume gives a comprehensive discussion of the history, nomenclature, geographical distribution and economic importance, significance in human nutrition, botanical characteristics and relationships, varieties, environmental and cultural requirements, rotations, field and harvesting practices, breeding work in the light of recent technique and discoveries, insect pests, and diseases of cereals. The first section is

devoted to grain crops in general, and subsequent sections deal in particular with rye, wheat, barley, oats, rice, corn, millet, sorghum, buckwheat, and minor cereals. An extensive bibliography is appended.

Size of seed experiment with cereals [trans. title], E. Korsmo (*Meld. Norges Landbr. Høiskole, 7 (1927), No. 5–6, pp. 299–374, figs. 8; Eng. abs., pp. 366, 367; Ger. abs., pp. 367–369*).—Four sizes of seed of each of spring wheat, barley, and oats were sown (*A*) in equal weights, and (*B*) in equal numbers. The largest kernels produced the best crops, yields in *B*-rows decreasing with diminishing size of seed somewhat more than in *A*-rows, and the largest kernels were accompanied by better germination, more even growth and ripening, and stronger and more smut-resistant plants than the smaller seed. In *A*-rows number of seedlings and kernels per unit area rose with decreasing seed size. The development percentage, number of plants at harvest: number of seeds, was greatest in the crop from the largest seeds, and fell in a smooth curve with decreasing seed size—to a lesser extent in *B*-rows than in *A*-rows. Tillering was the greater as the plants per unit area decreased, seed size and quality being of minor importance in this respect. Productivity fell with decreasing seed size in A-rows and increased in B-rows. Unfavorable environmental conditions caused reductions in crop proportional to decreasing seed size. Plants from larger seeds proved to withstand weeds better than those from smaller seeds, and weed vigor appeared to increase with decreasing size of crop seed.

Symposium on "procedure and results of small grain breeding" (*Jour. Amer. Soc. Agron., 19 (1927), No. 8, pp. 689–749*).—Papers presented at the meeting of the American Society of Agronomy held in December, 1926, at Philadelphia include Theoretical Aspects of Small Grain Breeding, by C. E. Leighty; A Program for Selecting and Testing Small Grains in Successive Generations Following Hybridization, by H. H. Love; Mechanical Operations of Small Grain Breeding, by C. F. Noll; What Has Been Accomplished by Breeding Small Grains, by R. J. Garber; and Distribution and Maintenance of Improved Varieties of Small Grains in Canada, by L. H. Newman.

Characteristics of three different varieties of barley of 2-rowed nutans δ-type [trans. title], E. Hellbo (*Meddel. Statens Cent. Frökontrollanst. [Sweden], No. 2 (1927), pp. 80–86, figs. 2; Eng. abs., p. 86*).—The much fewer teeth found on the lower part of the middle vein of the awn (on 1 cm. as well as on 3 cm.) of Svalöf Brage barley seems to differentiate it from Svalöf Chevalier II. The third δ-type, Weibull Puke, differs from the others in its longer and slighter rachilla, which is straw colored shortly before ripening and later gray-brown.

[Varieties of oats and spring wheat], E. Hellbo (*Meddel. Statens. Cent. Frökontrollanst. [Sweden], No. 2 (1927), pp. 55–79, figs. 6; Eng. abs., pp. 77, 78*).—The characteristics of 20 varieties of oats and 9 of spring wheat grown in Sweden are set forth with determinative keys as the result of studies at the Swedish State Seed Testing Station during 1925–26. The merits of differentiating characters are indicated.

Yield from scarified seed not always higher, C. R. Megee (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 12, 13*).—No appreciable differences were observed in the yields, either annual or five-year average, of scarified and unscarified northern grown common alfalfa seed.

Production of nodules on different parts of the root systems of alfalfa plants growing in soils of different reaction, P. E. Karraker (*Soil Sci., 24 (1927), No. 2, pp. 105–107*).—Experiments wherein alfalfa plants were grown in soils from limed and unlimed plats of certain of the fertility fields of the Kentucky Experiment Station gave indications that nodule production cor-

relates with soil reaction fully as well when a particular reaction is acting on only a part of the roots of a plant as when acting on the entire root system. The effect of soil reaction on nodule production seemed independent of any antecedent general effect on the host plant. The effect appeared to be direct on the bacteria in the nodule, or the effect of the soil reaction in changing the nature of the plant tissues and thus indirectly affecting the nodule bacteria, was so localized as to affect only that part of the roots of plants directly in the soil of the reaction in question.

Relation of length of staple to yield and value per acre of cotton in the Southeastern States, R. R. Childs (*Jour. Amer. Soc. Agron., 19 (1927), No. 8, pp. 754*, 755).—Data from experiment stations in North Carolina, South Carolina, Georgia, and Alabama showed that cotton averaging ⅞ to $\frac{15}{16}$ in. in length of staple returns the highest yields and highest acre values. The decrease in yield as length of staple increases is 15 per cent for the first $\frac{1}{16}$ above 1 in. and 6.5 per cent for each additional $\frac{1}{16}$. Even when one best variety in each group is considered, cottons stapling longer than 1 in. do not yield as high as those with $\frac{15}{16}$ in. staple. Mexican $1\frac{1}{16}$ in. in North Carolina and Acala $1\frac{1}{16}$ in. in Alabama were slightly more profitable, suggesting the need for selection and adaptation of varieties to conditions prevailing in each State.

At the Mississippi Delta Substation staple cottons yielded relatively high as compared with $\frac{15}{16}$ in. cottons, and when one best variety in each group is chosen the $1\frac{1}{16}$ and $1\frac{3}{16}$ in. cottons bred by this substation returned the highest yields and a much higher acre value than other staple lengths. Conditions in the Delta and the States farther east differed principally in soil fertility and soil moisture.

Vicinism or natural crossing in cotton, H. B. Brown (*Mississippi Sta. Tech. Bul. 13 (1927), pp. 14*).—In experiments at the station and the Delta Substation involving Winesap or Willet Red Leaf and upland varieties of cotton, natural crossing between adjoining rows ranged from 1.6 to 14.7 per cent, averaging 6.2 per cent. A limited amount of crossing was observed at more than 100 yds. Individual green leaf plants grown at various points in a plat of red leaf cotton had more than 50 per cent of seed crossed. Natural crossing may be harmful in producing general deterioration, or it may be used to advantage by the plant breeder. The one variety community is a means of prevention of the harmful effects.

Inbreeding Express cotton did not result in apparent loss of fertility, although the strains seemed to decrease in vigor. F_1 hybrids of inbred strains showed heterosis in height and yield.

Growth of fruiting parts in Gossypium cernuum, an Asiatic cotton, R. E. Beckett (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 97–106, figs. 4*).—The growth rates and sequence in development of fruiting parts of Garo Hill or wool cotton (*G. cernuum*) were determined at Greenville, Tex., by the same methods used on the Egyptian and upland types of cotton and reported earlier (E. S. R., 50, p. 30; 53, p. 326; 56 p. 629).

The interval between the appearance of successive fruiting branches on the main stalk was found somewhat shorter in the Garo Hill cotton than in the other types, while the interval between successive squares on the branches was somewhat longer. Shedding of abortive bolls in Garo Hill occurred more promptly, within 3 to 5 days after flowering, while many abortive bolls of Lone Star were held for 6 to 8 days, and some from 9 to 11 days. The growth rate of the buds and bolls was nearly the same as in the other types. Bolls of Garo Hill took somewhat longer to mature than Lone Star bolls. In the latter part of the season the maturation period of Garo Hill bolls was found to

lengthen, agreeing with the behavior of the Lone Star and Pima varieties. Bolls set early in August had a period 10 to 12 days shorter than those set in September.

Growth, bud-shedding, and flower production in Egyptian cotton, M. A. Bailey and T. Trought (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 65 (1927), pp. [1]+40, pls. 33*).—Investigations with several varieties of Egyptian cotton, evidently supplementing work reported elsewhere (E. S. R., 57, p. 429), indicated that the rate of elongation, i. e., increase in height, is not a satisfactory index to rate of increase in mass. The daily fluctuations in rate of flowering did not seem to depend on fluctuations in the rate of differentiation or rate of elongation. Transpiration data showed that during the summer availability in the plant of water usable for elongation appears to control the daily course of elongation and provided further evidence of the controlling influence of water supply on the increase in height. The experimental results indicated that bud shedding often occurs in such quantity that subsequent flower production is decidedly affected. While it does not take place haphazardly, it does not occur at a uniform rate throughout the season. Most buds appeared to fall off at an early stage—when they were about 2 mm. or less across the epicalyx. Conditions inducing shedding of the smallest buds appeared also to cause shedding of other sizes.

***Studies in Gujarat cottons, Part IV*, M. L. and S. J. Patel** (*India Dept. Agr. Mem., Bot. Ser., 14 (1927), No. 4, pp. [2]+131-176*).—The fourth part of this series (E. S. R., 55, p. 828) reports an inquiry into the inheritance and genetic correlations of seven characters which were studied in the parents and F_1 to F_4 generations of Broach-deshi × Goghari varieties of *Gossypium herbaceum*.

The stem node bearing the first sympodium, boll diameter, boll shape, staple length, weight of seed, and lint index all appeared to be complex characters, the behavior of which indicated the possibility of obtaining by hybridization types surpassing the parents in certain values. Factors determining the shape of boll seemed to be closely linked. Genetic correlations were not apparent between seed weight and lint length or lint index, nor between lint index and lint length. In certain cases ginning percentage negatively correlated with lint length.

[Sixth annual report of the Empire Cotton Growing Corporation] (*[London]: Empire Cotton Growing Corp., 1927, pp. 18*).—The sixth report of progress includes a short account of the cotton work of the genetics department of the research station in Trinidad, by S. C. Harland.

International Cotton Congress, Egypt, 1927 (*Manchester, Eng.: Internatl. Fed. Master Cotton Spinners and Manfrs. Assocs., 1927, pp. 263, pls. 6, figs. 58*).—This report of the congress held in Cairo and Alexandria, Egypt, January 25 to February 5, 1927, includes papers concerned with Egyptian cotton and dealing with improvement and seed distribution, wilt, pink boll worm, culture, irrigation and drainage, crop forecasts, economic factors, production costs, varietal purity, spinning value, and quality and defects in cloth.

Annual report of the Indian Central Cotton Committee, Bombay, 1926 (*Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1926, pp. IV+169*).—The activities of the organization (E. S. R., 55, p. 736) are summarized for 1926, with brief accounts of technological and research work in progress in different localities in India.

The maintenance of pure and vigorous stocks of varieties of the potato (*Scot. Bd. Agr. Misc. Pub. 3, rev. ed. (1927), pp. 106, pls. 7*).—Practical information is given on the characteristics of potato varieties and methods of roguing standard commercial varieties are described and their rogues are indi-

cated, and ways are suggested to prevent the loss consequent on disease and mishandling.

Storage of seed potatoes, J. BUSHNELL (*Ohio Bimo. Bul., 12 (1927), No. 5, pp. 142–148, figs. 3*).—Investigation of methods of storing seed potatoes under farm conditions showed that during the resting stage potatoes remain dormant and firm at any ordinary storage temperature. After the termination of this stage (December or January for Russet Rurals), the storage temperature should be 41° F. or lower to prevent sprouting. During winter, storage temperatures may best approximate 38°. Ventilation seems seldom necessary until the temperature rises to about 50° in the spring. Cool storage, in which the tubers remain firm with little sprouting, appeared to be better than greening, whereas with the warmer storage came the greater wilting and sprouting and the greater advantage from greening. Similar precautions are to be observed in both cellar and pit storage.

Phyllotaxis and leaf-obliqueness as separation characters in seedling canes, N. L. DUTT (*Agr. Jour. India, 22 (1927), No. 3, pp. 186–191, pls. 2*).—Studies at the Imperial Sugarcane Station at Coimbatore indicated leaf obliqueness (asymmetry) and phyllotaxis to be not absolute characters but easily recognizable, and as such to be preferable to very minute and obscure characters in differentiating sugar cane seedlings.

The bad effect of leaf pruning upon the growth of stalk and root of sugar cane, F. MUIR and R. H. VAN ZWALUWENBURG (*Hawaii. Planters' Rec., 31 (1927), No. 2, pp. 110–112, figs. 2; abs. in Facts About Sugar, 22 (1927), No. 23, p. 551*).—Experiments showed that root development in sugar cane is retarded in proportion as the stalks are deprived of leaves. The frequently poor root development in cane severely attacked by leaf hopper is to be interpreted as the result of leaf hopper injury and not as indicating that the cane is more susceptible to such attack because it has a poor root system.

The reference book of the sugar industry of the world (*La. Planter, Ref. Book Sugar Indus. World, July, 1927, pp. 27–94, pls. 3, figs. 39*).—Articles of interest to agriculturists in this fifth annual review of the sugar industry include The Application of Agricultural Research to Increase Sugar Production, by W. P. Alexander; The Cultivation of Ratoons in Un-irrigated Cane Fields in Cuba, and The Control of Sugar Cane Mosaic in the West Indies, both by R. Menendez Ramos; Soy Beans in the Cane Belt of Louisiana, by W. R. Dodson; Some Fungi Associated with the Root Disease of Sugar Cane in Louisiana, by E. C. Tims and P. J. Mills; Insecticidal Control for Sugar Cane Borer, by W. E. Hinds and H. Spencer; Control of Sugar Cane Insects in Hawaii, by C. E. Pemberton; The Rôle of Research in Soil and Plant Interrelations in the Sugar Industry, by W. T. McGeorge; A Short Sketch of the History, Activities, and Organization of the Hawaiian Sugar Planters' Association, by R. H. King; and Elimination of Colloids from Sugar Liquors and Factors Which Influence Colloid Stability, by H. S. Paine.

Select varieties of wheat, C. A. MOOERS (*Tennessee Sta. Circ. 15 (1927), pp. 2*).—Attention is called to the merits of the Pennsylvania 44 (E. S. R., 46, p. 397), Mammoth Red, Leap Prolific, Fultzo-Mediterranean, and Early May varieties of wheat.

Why applications of nitrogen to land may cause either increase or decrease in the protein content of wheat, W. F. GERICKE (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 133–139*).—Investigations at the University of California (E. S. R., 54, p. 323; 57, p. 434) showed that the amount of nitrogen available to wheat plants at different growth stages affects the protein content of the grain. The author suggests that some of the contradictory results

reported on the effect of fertilizer applications on the protein content of wheat may be explained by varietal peculiarities. It is emphasized that the properties of wheat varieties are able to affect markedly the efficiency of any fertilizer treatments.

[The Swedish State Seed Testing Station], H. WITTE (*Meddel. Statens Cent. Frökontrollanst. [Sweden], No. 2 (1927), pp. 1–54; Eng. abs., pp. 52–54*).—The activities of the station in determining the germination, purity, and other characteristics of agricultural seed and the control and certification of field crops seed are reported for the year 1925–26, and new rules for seed analysis are summarized.

An alkali forage weed, Bassia hyssopifolia, P. B. KENNEDY (*Jour. Amer. Soc. Agron., 19 (1927), No. 8, pp. 750–752, figs. 2*).—*B. hyssopifolia*, described as an annual introduced from western Asia, is said to flourish on land too alkaline for most cultivated crops and to be relished by stock. Analyses at the California College of Agriculture indicated that Bassia compares very favorably with alfalfa as a forage if it is grazed while the plant is in its younger stages or up to blossoming time before the stems begin to get hard and woody.

Controlling weeds with thermogen paper, W. H. HICKS (*Canada Expt. Farms, Agassiz (B. C.) Farm Rpt. Supt. 1926, pp. 24, 25*).—Paper mulch 18 in. wide laid on either side of the row when potato plants were about 4 in. high did not control weeds, and the potatoes were considerably outyielded by the unpapered but normally cultivated check. When cabbage and tomato plants were dibbled through the paper at transplanting the plants showed a greater early vigor which, however, was overcome by the checks later in the season. The paper suppressed the weeds with these two crops.

HORTICULTURE

[Horticultural investigations at Cheshunt, England], W. F. BEWLEY, W. CORBETT, and A. A. RICHARDS (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 12 (1926), pp. 13–25, 72–78, 92–101, figs. 6*).—As in the preceding year (E. S. R., 56, p. 41), greenhouse investigations on tomato culture continued to be an important activity. No differences of importance were found either in growth or yield of plants receiving in addition to a basic treatment stable manure at the rates of 15, 30, 60, and 90 tons per acre. Records taken upon the effect of time of application and the amount of water given tomatoes showed no appreciable difference between the yields of the several treatments, but ripe fruits were gathered 6 days sooner and the vigor was best on the first watered lot. Tomato fruits from plants growing in soil from which nitrogen had been withheld consistently for the preceding 11 years ripened more quickly than those from plants treated normally. Conversely, the ripening period was lengthened when potash was withheld.

Less blotchy fruits were harvested where potash was combined with nitrogen than where nitrogen was used alone. Supplementing complete fertilizer with grass cuttings was without effect. Phosphorus had apparently no effect upon the tomato, for no difference could be observed between 0, 8, 16, and 24 per cent. In respect to nitrogen, 5 per cent as sulfate of ammonia was as effective as more, except in the reduction of the number of blotchy fruits. Potash beyond 7.5 per cent gave no benefit except in reducing blotchy fruits, which were unusually prevalent (24+ per cent) on the no-potash plants. In another series of fertilizer experiments the addition of grass cuttings gave slightly higher yields except on the plat where phosphates were omitted. In variety tests Water Baby produced the most total fruit and Ailsa Craig the largest amount of

Greenhouses in which the same soil had been maintained since 1926 showed gradual declines in yield, both in the manured and unmanured plats. Steaming the base or the soil upon which cucumber beds were placed notably increased yields and rendered old beds as productive as those newly prepared. Ashes proved a better base for beds than did gravel. Of five sterilizing treatments, nothing, cresylic acid, steaming, emulsified cresylic acid, and formaldehyde, used on old cucumber beds, steaming was most beneficial in respect to yield, and the last two treatments were without effect. Leachings from old unsteamed cucumber soil had a reducing effect upon the yield of plants on freshly steamed soil. Manure prepared from barley straw by the addition of chemicals gave 9 per cent larger yields than did stable manure. Experiments in several commercial greenhouses gave positive evidence of the value of steaming as a method of sterilization.

Daily records taken by Corbett upon the opening and the pollination of tomato flowers and the ripening of the resulting fruits showed variable behavior in different plants, some being constant in the time required for fruits to mature and the others variable. Results of studies by Richards of the effect of various soil mixtures and fertilizers upon the germination and growth of seedling tomatoes suggest that old sterilized cucumber soil reinforced by the addition of one part of freshly dug clay is an excellent growing medium. No benefit was derived from adding fertilizers; in fact, the results indicated that serious damage may result from excessive nutrition.

Carbon dioxide investigations, T. SMALL (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 12 (1926), pp. 66–72*).—Earlier experiments (E. S. R., 56, p. 41) having shown the beneficial effect of carbon dioxide on greenhouse plants, a study was made of the efficiency of various methods of generating the gas. The so-called "Cardyox" apparatus, a light portable stove using a specially prepared fuel, was found most efficient. In chambers of equal carbon dioxide content, stirring the air with electric fans apparently decreased yields, an unexpected and perplexing result. Even with the aid of carbon dioxide attempts to grow two crops of tomatoes per year did not prove profitable.

Forcing of plants with hydrocyanic acid gas, G. GASSNER and W. HEUER (*Praktische Anleitung zum Frühtreiben von Pflanzen mittels Blausäure. Berlin: Paul Parey, 1927, pp. 30, figs. 12*).—Noting that cyanide not only killed insects but also favorably influenced the growth of orange trees, apparently by stimulating the growth of dormant buds, the authors studied the effect of the gas on various plants and secured under controlled temperatures and measured applications favorable results with the lilac, snowball, forsythia, cherry, deutzia, lily of the valley, and *Iris pumila*.

Investigations concerning the stringlessness of varieties of beans [trans. title], J. H. L. JOOSTEN (*Meded. Landbouwhoogesch. Wageningen, 31 (1927), No. 3, pp. 49, pls. 10; Eng. abs., pp. 48–49*).—Studies at the Wageningen School of Agriculture, Netherlands, indicated that stringlessness in pods of *Phaseolus vulgaris* is not a constant character and is probably greatly influenced by external factors. Pods revealing various gradations in respect to stringlessness were found on a single plant. No absolutely stringless variety was found and is not believed to exist; hence, hybridization can not be expected to reveal absolute information concerning the inheritance of the stringless character. Anatomical studies suggested a probable relation between the structure of the sheath of the groups of vascular bundles along the dorsal and ventral sutures and certain strengths of strings. Two types of anatomical structures were distinguished, one characterized by a similarity of all the cells in the sheath and the other by a narrow and often short group of wood cells which sometimes have sclerenchymatic cells in the inside.

The determination of quality in sweet corn seed by means of the optical measurement of leached materials, C. F. Hottes and W. A. Huelsen (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 147–166*).—In studies carefully checked by sowing part of each sample in the greenhouse, the authors found that the viability of sweet corn seed may be accurately determined by observations on the character of the leachings in distilled water. Observations with the Abbé refractometer showed leaching to be more rapid in killed seed, and also that the rate of loss increases progressively with the temperature in both killed and living seed. *Strong viability is usually associated with a clear* liquid, and the reverse is true in case of weak viability. Readings taken with a converted Duboscq colorimeter were also found to be serviceable indexes to viability. Apparently healthy and vigorous protoplast allows only small quantities of colloidal materials to leach through the membranes, and, conversely, injury and disease apparently resulted in physical and chemical changes within the protoplast with an accompanying weakening of the semipermeable properties. The permeability of the protoplast is measured by dispersity of colloids in distilled water. No germination test proved as conclusive a measure of a weakened condition of the seed as did the optical test upon the leachings.

Eggplant culture, M. M. Parker (*Virginia Truck Sta. Bul. 55 (1926), pp. 477–487, figs. 2*).—General directions are given for the production of plants, culture in the field, control of insect and disease pests, etc.

Kale fertilizers, H. H. Zimmerley and M. M. Parker (*Virginia Truck Sta. Bul. 54 (1926), pp. 465–476*).—Of various carriers of nitrogen, nitrate of soda, sulfate of ammonia, animal tankage, Leuna-saltpeter, and urea compared as top-dressings for kale, all except the tankage proved equally efficient. The addition *of animal tankage to the mixture to supply one-half the nitrogen* resulted in an average decrease of 31 bbls. of kale per acre as compared with yields from water-soluble ammoniates alone. The largest yield was obtained where nitrogen was secured equally from nitrate of soda and ammonium sulfate. Observations failed to show any significant differences in color of foliage, resistance to cold, or in type of growth that could be attributed to the source of nitrogen. Because of the large fertilizer requirements of kale, the authors recommended that on soils of the type studied, fertilizers be applied in two applications, 500 lbs. of 5–10–5 NPK in the row before seeding and from 600 to 1,200 lbs. of 9–6–5 when the plants are about 6 in. tall.

Soil acidity in relation to spinach production, H. H. Zimmerley (*Virginia Truck Sta. Bul. 57 (1926), pp. 499–521, figs. 5*).—As determined by cylinder and field studies, the results of which were comparable, the soil reaction range for the optimum growth of spinach was rather limited, occurring usually between pH 6.5 and 7. The lower limit of profitable production under otherwise favorable growing conditions was reached at pH 5.5, below which point spinach plants failed to develop normally. Acidity injury was manifested in a low percentage of germination, yellowing and burning of the tips of seedling leaves, browning of the roots, death of many of the plants, and slow growth of the remainder. The effectiveness of lime in reducing acidity, measured by H-ion concentration, varied with different types of soil, the greatest decrease for each 1,000 lbs. of hydrated lime applied occurring on the lightest type, Sassafras fine sandy loam. Very finely divided forms of lime, such as hydrated lime, were required to give rapid results. *Heavy applications of lime may not only be wasteful,* but also dangerous, as alkalinity frequently induces a chlorotic condition in the spring crop. Applications of manganous sulfate reduced this chlorotic condition only in the early stages of the trouble. For satisfactory spring production of spinach the author recommends that the soil should be maintained in a slightly acid condition—pH 6 to 6.4.

Determinate growth in the tomato, A. F. Yeager (*Jour. Heredity, 18 (1927), No. 6, pp. 263–265, figs. 3*).—From a cross made at the North Dakota Experiment Station between the Red River and the Self Pruning tomatoes there appeared in the F_2 generation a number of promising segregates combining the early maturity of the Red River and the determinate growth habit of the Self Pruning variety. The determinate habit of growth behaved, therefore, as a simple Mendelian recessive.

Fruit culture, E. Pamart (*Arboriculture fruitière. Paris: Libr. Octave Doin, 1927, pp. II+352, figs. 304*).—Preceded by opening remarks upon the physiology of growth and reproduction, this general treatise discusses propagation, culture, pruning, spraying, and other practical phases of fruit growing.

An evaluation of certain methods used in the study of the pollination requirements of orchard fruits, L. H. MacDaniels (*Mem. Hort. Soc. New York, 3 (1927), pp. 139–150*).—In reviewing the results, often conflicting, of apple pollination experiments in various parts of the United States, the author concludes that self-fruitfulness is not a fixed character but is greatly influenced by environmental and other factors, the importance of which is difficult to evaluate. A large part of the confusion is deemed to be the result of incomplete presentation of the data in regard to the condition and the treatment of the trees, methods of technique employed, and the manner of taking the records.

The results of cross-pollination between different varieties of apples, pears, plums, and cherries, R. Wellington (*Mem. Hort. Soc. New York, 3 (1927), pp. 165–170*).—A discussion of the more important compatibilities and incompatibilities found at the New York State Experiment Station in hybridization studies with various fruits.

Field studies of the pollination requirements of certain deciduous fruits under California conditions, W. P. Tufts, A. H. Hendrickson, and G. L. Philp (*Mem. Hort. Soc. New York, 3 (1927), pp. 171–174, fig. 1*).—Field studies at the California Experiment Station have shown all varieties of almonds tested to be self-sterile, apricots self-fertile, sweet cherries and Japanese plums generally self-sterile, and European plums divided in respect to sterility. Observations in 1926 indicated that the J. H. Hale peach is not self-sterile under California conditions. Bees proved of material assistance in pollination.

The comparative effect of various kinds and amounts of fertilizers upon yearling apple trees, H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 59–67*).—Expanding an earlier test (E. S. R., 55, p. 742), in which nitrate of soda was found to injure young apple trees easily, ammonium sulfate, cyanamide, ammo-phos, urea, hen manure, potassium chloride, acid phosphate, and bone meal were included in the trials. Surface applications to 1-year-old Cortland apple trees of various amounts of cyanamide, nitrate of soda, ammonium sulfate, urea, and hen manure resulted in either decreased growth or in no increase, with the exception of moderate application of urea where a marked response was shown. Injury appeared to be in proportion to the amount and availability of the material, indicating a physical nature such as plasmolysis rather than a chemical one.

The possibilities of Wood's clover as an orchard cover crop, H. B. Tukey (*Amer. Soc. Hort. Sci. Proc., 23 (1926), pp. 56–58*).—Wood clover, an introduction from Iowa, was found useful as a cover crop on Hudson River Valley soils low in humus and fertility and strongly acid, and is therefore recommended for trial in orchards, especially young orchards where shading has not become a pronounced factor.

Does fruit thinning pay? E. C. Auchter (*Md. State Hort. Soc. Rpt., 29*

ment Station with 12-year-old Stayman Winesap trees carrying a heavy set of fruit showed that thinning materially increased size, color, and percentage of uniform unblemished fruits. The largest amount of marketable fruits resulted from 6- to 8-in. spacing. Similar results were secured with vigorous 18-year-old Stayman Winesap trees and to a somewhat lesser degree with 16-year-old Stark trees.

A distinct varietal response was shown in thinning tests with peaches. Greensboro responded better to heavy thinning than did Elberta, and in a dry year (1923) when not thinned produced only 2 per cent of its fruit over 2 in. in diameter as compared with 32.5 per cent for Elberta. A spacing of 6 to 8 in. proved best for Greensboro and 3 to 4 in. for Elberta. Tests with Japanese plums gave positive evidence of the desirability and even the necessity of thinning these fruits.

The time of differentiation and the subsequent development of the blossom bud of the plum, E. BALL (*Jour. Pomol. and Hort. Sci., 6 (1927), No. 3, pp. 198–208, pls. 4*).—Investigations at the Long Ashton Research Station, England, with buds of the Victoria, Pond Seedling, and Monarch plums showed the earliest signs of blossom bud differentiation in the period from mid-July to early August. Victoria buds, whether from vigorous standards or from dwarf trees, passed through the early stages of differentiation more rapidly than did those of the other two varieties. Sepals, petals, stamens, and pistils were present in all three varieties by November, but the ovules and the pollen grains were not usually formed until January or February.

Field experiment on the manuring of gooseberry bushes, T. WALLACE (*Jour. Pomol. and Hort. Sci., 6 (1927), No. 3, pp. 184–197*).—Studies at the Long Ashton Research Station, England, showed potash to be the limiting factor to the growth of the gooseberry on the soil in question; in fact, where nitrogen and phosphorus were applied without potash there was observed a deleterious effect upon both growth and yield. Poor growth was invariably accompanied by leaf scorch. Potash manures did not influence the spread of Botrytis infection, as vigorous bushes were affected the most and weak bushes suffering from potash starvation were only slightly injured.

The correlation between some characters of progeny and parent in the strawberry, E. BALL (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1926, pp. 36–41, pl. 1*).—Of three types of Royal Sovereign strawberry plants, namely, vigorous, medium, and weak, the vigorous plants yielded the highest percentage of vigorous progeny. In this respect all three groups were benefited by the removal of part of the new stolons; in fact, limiting the stolons tended to render the progeny of the medium-vigor group comparable to that of the unlimited strong group. An examination of the progeny of plants which exhibited differences in the proportion of blossoms to foliage revealed no inheritance of these differences.

Of 214 runner plants taken in 1925 from blind or blossomless plants, some normal but others generally weak, all except 12 bloomed the succeeding season; furthermore, all the original parents bloomed the second year, leading to the suggestion that blindness in the strawberry is probably associated with internal conditions at the time of blossom-bud differentiation. However, at times off-type vegetative rogues appear in fields of cultivated varieties and should be destroyed.

Some changes occurring during the ripening of grapes (third paper), P. R. v. D. R. COPEMAN (*Union So. Africa Dept. Agr., Sci. Bul. 60 (1927), pp. 19, figs. 6*).—Bearing out the results of earlier studies (E. S. R., 57, p. 140), it was again found that sugar and acid contents are the most important indexes to

maturity in grapes. Changes in total solids were found to follow closely the changes in sugar content, the difference at maturity becoming practically constant, suggesting that at this stage increases in solid content are due almost entirely to increases in sugar content. A slow decrease in the nitrogen content of the berry during ripening is believed associated with the rapid production of sugar. The relationships between acids, sugars, and solids indicate the establishment of a definite equilibrium of these materials at maturity.

Report on the Lime Experiment Station, Dominica (*West Indies Imp. Dept. Agr., Dominica Agr. Dept. Rpt., 1925–26, pp. 10–24*).—Of five fertilizer treatments, namely, nothing, mulch of lemon grass and foliage of *Gliricidia maculata*, nitrogen and phosphates, nitrogen and potash, and complete fertilizer, applied to lime trees, the largest yields in 1925–26 were obtained on the nitrogen plus potash plats. The increases above the mulched and the other fertilized plats were, however, small. Over a 9-year period the complete fertilizer plat was the most productive. The value of fertilizers was also shown in an experiment with younger trees.

Comparing common limes and spineless limes, both budded on sour orange, the common limes were more productive. In a test of various citrus the Eustis limequat and the sour lime alone failed to show satisfactory progress.

In cacao fertilizer tests the largest yield of cured product was secured in 1925–26 on the complete fertilizer plat.

Sterilities and seed production in dahlias, J. B. S. Norton (*Mem. Hort. Soc. New York, 3 (1927), pp. 39, 40*).—The author points out that many of the large, double flowered dahlias are sterile or bear only a few seeds in the center of the head. Short day lengths apparently stimulate fertility so that seed may be produced in very double forms by planting early in the greenhouse or by covering to shorten the day length. Self-fruitfulness is rare; of about 30 varieties grown in the greenhouse in early spring, only one produced seed from self-pollination. Crosses attempted between the dahlia and species of Bidens and of Coreopsis gave negative results.

Dormancy in hybrid seeds, W. Crocker (*Mem. Hort. Soc. New York, 3 (1927), pp. 33–38, fig. 1*).—Seeds of various North Temperate Zone forms of Rosaceae were found to have for after-ripening rather well-defined temperature optima, quite generally in the region of 5° C. (41° F.), and to have a distinct after-ripening time at their respective temperature optima. It was found also that an adequate water and oxygen supply is required in the stratification bed, and that in some cases it is important to regulate the acidity of the medium. Freezing had no effect on after-ripening provided it was not severe enough to cause actual injury. A rise in temperature much above the optimum tended to throw the seeds back into a dormant condition. Roses of northern parentage apparently required lower after-ripening temperature than did those of warm climate ancestry.

Damson plum seeds germinated strongly when transferred to a warm situation after from 12 to 16 weeks at 5° C. Peaches apparently had a higher temperature requirement, as little difference was found between 5 and 10°. Removal of the stone coats hastened germination and increased the percentage of germination very markedly in the peach. In the case of French pear seeds, after-ripening temperatures of 0, 5, and 10° were all favorable. Peat proved a very satisfactory medium for pear seed, and the treatment prior to stratification with uspulun or semesan reduced losses from decay. *Cornus nuttallii* germinated more rapidly after stratification at 0° than at higher temperatures. Stratification was accomplished by simply mixing the seeds in the medium.

FORESTRY

History of the forests of Belgium, I–III, Goblet d'Alviella (*Histoire des Bois et Forêts de Belgique. Brussels: Maurice Lamertin, 1927, vols. 1, pp. XVI+7–491, pls. 19; 2, pp. XII+851, pls. 17; 3, pp. [12]+140, pl. 1*).—These three volumes comprise the first portion of a study of forestry and the forests of Belgium, and cover the period from the earliest records to the end of the Austrian régime.

Soil organisms: The dependence of certain pine species on a biological soil factor, S. L. Kessell (*Empire Forestry Jour.* [*London*], *6* (*1927*), *No. 1, pp. 70–74, pls. 2*).—In establishing forest nurseries in various parts of Western Australia, it was found that *Pinus insignis* and *P. Pinaster* seeds germinated well but that the young plants failed to develop satisfactorily, except in isolated patches the soil of which was neither physically nor chemically different from the rest of the field. Applications of soil taken from old established pine nurseries resulted in a revival of vigor, leading to the conclusion that it is necessary when raising exotic species of conifers to first infect the soil by either applying a light dressing of old nursery soil or by bringing in pine seedlings from established nurseries. Trees taken from old nurseries made much better growth when planted out in the field. The soil organism responsible was apparently equally beneficial to various species of pine, including *P. pinaster*, *P. canariensis*, *P. muricata*, *P. taeda*, *P. caribaea*, *P. palustris*, and *P. halepensis*.

Effect of soil coverings upon the germination and growth in Norway spruce [trans. title], K. Rubner (*Forstwiss. Centbl., 49* (*1927*), *No. 5, pp. 168–183, figs. 6*).—Observations upon the germination and early growth of Norway spruce seeds planted in pots of fertile garden soil, quartz sand, tenacious clay, and raw humus, and covered to various measured depths with the same materials, except in the case of the clay soil, showed not only the highest germination but also the best growth and survival in the fertile garden soil lots covered 0.5 and 1 cm. deep. The most uniform germination, irrespective of the depth of the cover, was secured in the raw humus lot, a fact believed due to the porous nature of the material. Germination in sand also varied but little. On the other hand, in garden soil and in clay germination decreased sharply in direct accordance with the depth of the covering.

Sand dune reclamation in Palestine, F. J. Tear (*Empire Forestry Jour.* [*London*], *6* (*1927*), *No. 1, pp. 85–93, pls. 4*).—Following an earlier contribution on the same subject (E. S. R., 53, p. 846), the author points out that plantings of *Ammophila arenaria*, a beach grass, when reinforced with plantings of *Artemisia monosperma* have arrested the movement of the drifting sand sufficiently to allow the planting of forest species. Of all the forest species tried, *Acacia cyanophylla* has given by far the best results, and preparations are under way to propagate the species in sufficient quantity to cover all the unplanted portions of the dune area under treatment. *Tamarix articulata* failed to live up to earlier promises, and *Eucalyptus rostrata* has thrived only where the roots have been able to reach the underlying soil. Among pine species tested *Pinus halepensis* has given the most promising results.

The redwoods of California and methods of afforestation, A. W. Hill (*Empire Forestry Jour.* [*London*], *6* (*1927*), *No. 1, pp. 21–24, pls. 6*).—A brief article emphasizing the long life and the durability of the wood of *Sequoia sempervirens*, and discussing nursery practices which have been developed in California for the propagation of this desirable species.

Hybridization between Pinus silvestris and P. montana [trans. title],

introduction of many exotic species of Pinus into Europe and the possibility of natural hybridization, the author points out that, although *P. silvestris* and *P. montana* have been associated for centuries, there is no definite evidence of inter-crossing. Various off-types have been exploited as natural hybrids between these two species, but completely negative results were secured in carefully controlled reciprocal crosses in the Eberswalde forest. It is pointed out, however, that certain strains of the species may possibly be compatible.

Girdling of hardwoods to release young conifers, H. L. CHURCHILL (*Jour. Forestry, 25 (1927), No. 6, pp. 708–714*).—Preceded by an introductory statement by A. Cary, the author discusses the means employed and the results obtained in releasing softwoods by the killing of hardwoods by girdling. Using an ax and removing a strip of bark from 6 to 12 in. in width, the average time required per tree was 2 minutes, 5 seconds. Later it was found that cutting once around while the trees were frozen was more rapid and equally effective. Girdling was not justified where more than 125 hardwood trees were present per acre. Based on operations covering 1,500 acres, the cost of releasing softwoods was about one-third of 1 ct. per tree.

Experimental tapping on Hevea seedlings and buddings on Tjinta Radja estate, C. HEUSSER (*Meded. Alg. Proefsta. Alg. Ver. Rubberplanters Oostkust Sumatra, Rubber Ser., No. 54 (1926), pp. 11, fig. 1; Eng. trans., pp. 8–11*).—Individual records taken upon young Hevea trees, some propagated by budding, some seedlings from controlled crosses, some from crosses with only the ovule parent known, and still others ordinary seedlings of unknown parentage, showed definitely the importance of using trees of known parentage. Trees budded from high-yielding parents were much more productive than the ordinary seedlings, but in one season were outyielded by seedlings both of whose parents were known, indicating the possibility of increasing rubber yields by saving seed from approved mother trees.

Log rules often give inaccurate estimate, J. C. DECAMP (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 17–20, fig. 1*).—A discussion of the relative merits of the Doyle, Scribner, and combined Doyle-Scribner log rules, all of which were found to be in use by Michigan buyers. The Scribner, the official rule for the U. S. D. A. Forest Service and for Minnesota, Idaho, Oregon, Wisconsin, and West Virginia, was found much more satisfactory for small logs than the Doyle rule. For example, in a mixed stand of beech, basswood, maple, and elm the Doyle gave 24 per cent lower estimates than the Scribner.

DISEASES OF PLANTS

Plant pathology in California, R. E. SMITH (*Phytopathology, 15 (1925), No. 2, p. 126*).—California physiological plant diseases are listed, with mention of examples of parasitism depending largely upon obscure environmental factors.

Plant diseases in 1925, A. B. BUCHHOLZ (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 18–22*).—The Farm Bureau manager for Columbia County, New York, presents brief statements regarding diseases, principally of different fruits but also of vegetables. The common diseases on fruits were not so severe during 1925 as during 1923 and 1924.

A summary of the prevalence of plant diseases in the Dominion of Canada, 1920–1924, compiled by F. L. DRAYTON (*Canada Dept. Agr. Bul. 71, n. ser. (1926), p. 88*).—In this first printed publication dealing with the prevalence of plant diseases in Canada, as ascertained by the Division of Botany in collaboration with other agencies indicated, it is stated that this work

started as the result of action taken by the Canadian Branch of the American Phytopathological Society at its first annual meeting in Guelph in 1919. Apparently four mimeographed reports have been published. The service is now a permanent part of the Division of Botany.

In the arrangement of this summary, the host plants have been grouped as cereal crops, forage and fiber crops, fruit crops, vegetable and field crops, forest and shade trees, ornamental plants, and miscellaneous plants. Under each host plant the diseases are dealt with as those caused by bacteria or by fungi and those nonparasitic in origin.

Two appendixes are included, one an account of anthracnoses caused by fungi of several genera, by J. Dearness, and the other on The Parasitic Fungi Found in Manitoba, by G. R. Bisby, I. L. Conners, and D. L. Bailey. Collaborators are indicated for each of the nine areas covered.

Plant diseases [and pests], S. Youngberg (*Philippine Bur. Agr. Ann. Rpt., 25 (1925), pp. 62–72, pls. 4*).—Brief notes are given on the diseases found in different provinces of the Philippines. An account, including tabular data, is included on coconut diseases (survey and eradication), as also of abaca diseases and pests and the parasitic Loranthus and bark rot of citrus. Entomological work is briefly noted, as is pathological work in the greenhouse dealing with several fungi.

[Plant diseases, Deli Experiment Station], S. C. J. Jochems (*Meded. Deli Proefsta. Medan, 2. ser., No. 42 (1926), pp. 14–23*).—An account, principally of tobacco diseases, lists causes and observed cases of disease in the field, also in the seed beds, for which complete sterilization is recommended.

Bacteriophagy in plant pathology [trans. title], C. Sibilia (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 6 (1926), No. 3, pp. 200–209*).—A brief historical account is given along with a statement of the present stage of the question regarding bacteriophagy, particularly in plants, with a discussion of its possible connection with immunity against disease.

Certain aspects of the virus diseases, H. H. McKinney (*Phytopathology, 15 (1925), No. 4, pp. 189–202*).—Aspects of studies carried on or participated in by the author (E. S. R., 49, p. 843; 50, p. 839; 53, p. 851), in particular the association of cell inclusions with mottling of wheat, have led to a study of collections of such inclusions associated with certain diseases of man and the lower animals, and these matters are discussed.

"One of the striking results which comes out of a general study of the virus problem is that no single lead or line of attack stands out as the one most likely to lead to the determination of the exact nature of the viruses. . . . Soil and air temperature studies have been carried out with a few hosts, and it is interesting to note that the mosaic diseases appear to be most injurious at temperatures which are seemingly most favorable to the development of the host plants."

Studies on the behavior of Fusarium cromyophthoron in carbohydrates, glucosides, proteins, and various decoctions, with a discussion on the "isometabolic point" of substances, C. P. Sideris (*Phytopathology, 15 (1925), No. 3, pp. 129–145*).—The author has designated as the isometabolic point the H-ion concentration toward which the final reaction was pointing in the cultures of different nutrient substances. The isometabolic point of dextrose solutions lies at or near pH 3.8, of amygdalin at 5, of potato starch at 5.2, of pectin at 6.4, and of beef broth at 7.4. The initial reaction of the cultures at the pH value of the isometabolic point was approximately maintained during the growth of the organism.

Cultural and morphological studies of some species of Taphrina, E. M. Martin (*Phytopathology, 15 (1925), No. 2, pp. 67–76, figs. 2*).—The results are given of studies of *T. johansonii*, *T. communis*, *T. mirabilis*, *T. coryli*, *T. deformans*, and *T. coerulescens*.

Thread blight, G. F. Weber (*Florida Sta. Bul. 186 (1927), pp. 141–162, figs. 9*).—A description is given of thread blight caused by *Corticium stevensii*, which is said to be common though not epidemically destructive in Florida. However, the fungus may sometimes cause as much as 50 per cent defoliation. The characteristic symptoms of the disease are said to be a matting together of killed leaves by fungus strands and the presence of superficial sclerotia. The fungus overwinters in the form of sclerotia. New hosts reported for this fungus are Virginia creeper, plum, pistache, soapberry, rose, pomegranate, persimmon, jujube, chinaberry, morning-glory, mu-oil tree, and tung-oil tree.

The author claims that the disease may be controlled by the application of a 4-4-50 Bordeaux mixture, accompanied by careful pruning.

H-ion concentration and the action of heat on the germinability of spores of Ustilago tritici [trans. title], L. Petri (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 6 (1926), No. 3, pp. 251, 252*).—Acid reaction in nutritive media did not protect the chlamydospores of *U. tritici* against the effect of high temperatures.

The application of certain organic mercury compounds in plant pathology, G. H. Godfrey (*Phytopathology, 15 (1925), No. 2, pp. 127, 128*).—Results reported by various experimenters in America indicate that the organic mercury salts are deserving of thorough consideration.

The effect of calcium carbonate on Bordeaux mixture, E. R. deOng and W. C. Root (*Phytopathology, 15 (1925), No. 3, pp. 183–186, figs. 2*).—In experimentation to determine the effect of calcium carbonate as an impurity in Bordeaux mixture, it was found that the rate of settling increases about in proportion to the amount of carbonate, and that this should not be greater than 20 per cent. Settling is retarded by increasing the proportion of copper sulfate.

Quantitative studies on the efficiency of fungicides, J. MacInnes (*Phytopathology, 15 (1925), No. 4, pp. 203–213, figs. 9*).—Results obtained by use of copper sulfate, mercuric chloride, and formaldehyde indicate rather definitely that, in connection with *Aspergillus niger* at least, conductivity may be used as a measure of the relative effectiveness of fungicides.

Efficiency of a self-mixing duster, R. E. Smith (*Phytopathology, 15 (1925), No. 4, pp. 235–237, fig. 1*).—A self-mixing duster, previously described (E. S. R., 49, p. 287), when tested with two different nicotine percentages was found to have mixed the nicotine with the hydrated lime almost perfectly after the machine had run for two minutes. Other advantages are claimed.

The action of some cereal seed treatments [trans. title], M. Mencacci (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 6 (1926), No. 3, pp. 216–235, pls. 2*).—Tests and results are outlined or detailed as made with Uspulun, Germisan, Vegetina, and Vigorina.

Cereal-smuts: An illustrated key to the New Zealand species, G. H. Cunningham (*New Zeal. Jour. Agr., 30 (1925), No. 6, pp. 374–378, figs. 6*).—To facilitate recognition of each species of cereal smut, so as to apply appropriate and timely control treatment, this article has been prepared in recognition of the fact that, on account of differences in life histories, the smuts are divided into two groups, each group requiring a different control treatment. In New Zealand there are, of cereal smuts present on wheat, *Ustilago tritici*, *Tilletia levis*, and *T. tritici*; on barley, *U. jensenii* and *U. tritici*; and, on oats, *U. avenae* and *U. levis*.

Cereal smut and X-ray [trans. title], V. RIVERA (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser.*, *6* (*1926*), *No. 3*, *pp. 237–241*).—The use of Roentgen rays did not reduce cereal smut infection.

Cereal foot rot and some associated fungi in Italy [trans. title], B. PEYRONEL (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser.*, *6* (*1926*), *No. 3*, *pp. 213–216*).—An increasing prevalence of cereal foot rot is reported in connection with the presence of fungi of the genera Fusarium, Leptosphaeria, Ophiobolus, and Rhizoctonia.

A Marasmius parasitic on small grains in Illinois, P. A. YOUNG (*Phytopathology*, *15* (*1925*), *No. 2*, *pp. 115–118*, *figs. 5*.)—*M. tritici* n. sp. is described as parasitic on wheat, barley, rye, quack grass, and an undetermined grass in Illinois.

Cereal rusts at Skierniewice in 1925 [trans. title], W. KONOPACKA (*Choroby i Szkodniki Roślin*, *1* (*1925*), *No. 4*, *pp. 31–35*; *Fr. abs.*, *p. 35*).—Observations on cereal rusts show a severe outbreak of yellow rust (*Puccinia glumarum*) on wheat. Black rust (*P. graminis*) was noted but rarely. Uredospores of brown rust (*P. dispersa*) persisted during the winter on oats, and the presence of teleutospores was observed in the early part of May on autumn leaves.

Some infection experiments with loose and covered smuts of oats which indicate the existence in them of biological species, K. SAMPSON (*Ann. Appl. Biol.*, *12* (*1925*), *No. 3*, *pp. 314–325*, *figs. 2*).—Some results of tests with two spore collections of *Ustilago avenae* and *U. levis* obtained from Missouri and from Wales indicate that *U. levis* spore collections under test represent two distinct biological species. Forms highly susceptible and forms resistant to *U. levis* appear to exist in the subspecies *glabrescens* of *Avena strigosa*.

The action of hot water on the spores of oat smut (Ustilago avenae) [trans. title], F. D. SKAZKIN [SKASKINE] (*Izv. Donsk. Inst. Selsk. Khoz. i. Melior.* (*Ann. École Supér. Agr. et Amélior. Don, Novotcherkassk*), *5* (*1922–1924*), *pp. 162–179*, *pl. 1*).—The author carried out experiments testing the effects of hot water on the spores of oat smut (*U. avenae*). The cultures were grown in distilled water under sterile conditions. It was found that the killing temperature for an exposure of 5 minutes is 60° C., for 20 minutes 55°. After exposures of 5 or 15 minutes at 55°, or 20 minutes at 50°, only single spores remained alive, these spores germinating only after considerable time. Treatments for 5 or 15 minutes at 50° or for 20 minutes at 45° also delayed somewhat the germination of the spores, but the numbers of spores killed were fewer in these cases. Thus the spore-killing effectiveness of hot water depends on both temperature and period of contact.

Stinking smut (*Jour. Dept. Agr. So. Aust.*, *27* (*1924*), *No. 8*, *pp. 776, 777*).—During 1923 tests were inaugurated to determine the relative effectiveness of seed treatments for control of stinking smut of wheat. These tests were conducted on the government farm at Minnipa on five plats, each about 25 acres in area.

All the fungicides retarded germination and none gave entire freedom from smut. Formalin excluded all but a trace of smut. Dollman's Friend gave late maturity.

Results of experiments in 1924 with various chemical dusts for smut control in wheat, H. P. BARSS (*Phytopathology*, *15* (*1925*), *No. 2*, *p. 127*).—Fall planted rod row tests with heavily smutted wheat (*Tilletia tritici* spores, 1:77) subjected to various chemical dusts at 2 oz. per bushel showed the best control with copper carbonate (50 per cent or more of copper) of standard fineness. Next in efficiency were the types of copper carbonate containing

from 17 to 21.5 per cent copper, followed by Seed-o-San, Semesan, and Corona 620. Nickel carbonate was much less effective. Complete smut control was not obtained with any material on wheat smutted at the rate of 1 to 77, yet with wheat smutted at 1 to 500 high-grade copper carbonate at 2 oz. per bushel gave complete smut control, while no other dusts gave less than 23 per cent of smut heads under similar conditions. At 1 to 1,000, copper carbonate with 50 per cent copper, the same with 21 per cent copper, and Semesan all gave good control.

Black point of wheat [trans. title], B. PEYRONEL (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 6 (1926), No. 1, pp. 10–25*).—A discussion is given of fungi in several genera as found, or as reported to have been found, in connection with black point of wheat grains.

***Conclusions from four years' tests of various methods of seed treatment* for bunt control in Idaho**, C. W. HUNGERFORD (*Phytopathology, 15 (1925), No. 2, p. 127*).—In extensive field tests carried out in northern Idaho and numerous plat tests, copper carbonate dust having at least 50 per cent copper was surpassed at 2 oz. per bushel by the standard copper sulfate and salt treatment, but not greatly at 3 oz. per bushel. At less than 50 per cent copper content, the carbonate had to be used in larger amounts. Semesan at 4 oz. per bushel was as effective as copper carbonate at 3 oz. Nickel carbonate at 3 oz. per bushel was not satisfactory.

With spring wheat in 1924, copper carbonate (six brands, 2 and 3 oz. per bushel), Corona 640 and 640S, Semesan dust, and Semesan and Uspulun liquid treatments reduced smut to less than 1 per cent in each case, the controls showing over 12 per cent. Furfural seriously injured germination and gave practically no control.

Report of seed-pickling trials, A. T. JEFFERIS (*Jour. Dept. Agr. So. Aust., 29 (1926), No. 8, pp. 709–712, 714, 715*).—This investigation, which was carried out in pursuance of a decision of the last Australian Conference of Ministers of Agriculture, comprised a chemical and mechanical examination of five samples of commercial copper carbonate and one sample of pure basic copper carbonate; an investigation of the effects of these on germination in the laboratory; and a determination in the field of the effects of these preparations on germination and growth, and the relative efficiency of wet and dry bunticides of various strengths and grades.

The results of this one-season work are considered as justifying (when taken in connection with similar experiments elsewhere) the belief that in recent years serious crop loss has been caused by a wet bluestone pickle, and that dry pickling with basic copper carbonate, though not equally effective, is sufficiently so to justify its use when consideration is taken of its complete harmlessness to the seed. It is inferred also that the standards arrived at by other investigators, namely, the quantity of 2 oz. per bushel of seed, and the grading of 90 per cent passing a 200-mesh sieve, have been justified by the above trials.

Wheat pickles, E. W. PRITCHARD (*Jour. Dept. Agr. So. Aust., 29 (1926), No. 9, pp. 781–786, figs. 4*).—This experimentation was carried out to test comparatively the fungicidal efficiency on wheat seed-borne bunt (*Tilletia tritici*) of copper sulfate and formalin solutions and copper carbonate dust.

With sound grain (undamaged in threshing), copper sulfate, both on cloth and in soil, slightly lowered germination; formalin was slightly beneficial; and copper carbonate was neutral. With damaged grain, copper sulfate gave marked injury both on cloth and in soil; copper carbonate showed marked detriment on cloth, almost as much in soil; and formalin showed no effect on cloth, a slightly deleterious effect in soil.

On the resistance of spring wheat to yellow rust [trans. title], V. A. PESOLA (*Statens Lantbruksförsöksverks.* [*Finland*], *Vetensk. Pub. 8 (1927), pp. [3]+176+22; Eng. abs., pp. 1–22, pl. 1, figs. 55*).—The problem of rust resistance in spring wheat is here treated chiefly from the standpoint of the plant breeder. The report deals with conditions and methods of investigation, the relation of varieties and strains of Finland spring wheat (here *Triticum vulgare*) to yellow rust (*Puccinia glumarum*), the inheritance, in crosses, of resistance to yellow rust, the combining of such resistance with earliness through crossing, the influence of time of sowing on resistance, the influence of different rust resistance on yields of crossings, and special experimentation on clipping of leaves.

Of the detailed results of the systematic study, it may be noted that the amount of rust on the same variety in different years is about the same, though great differences are apparent in the rusting of different varieties. These facts strongly support the view that the resistance of spring wheat to yellow rust is a variable character which is due to internal hereditary characters.

Representing rust resistance on a scale of 1 to 10, with subdivisions represented by one-place decimals, the author finds that spring wheat may be divided into four groups. Study of these groups shows that varietal and strain resistance, by groups, clearly and regularly increases as the period of growth lengthens. It appears also that there are varieties or "sorts," which are, in different countries and during different years, to approximately the same degrees rust resistant. *T. monococcum* is instanced in this connection. Resistance in crosses is dealt with in detail as studied with varietal crossings. It is considered as obvious that the special rust resistance of wheat is due to a reciprocal subtle and complicated reaction of the protoplasm of the host and that of the fungus.

It is regarded as important, particularly in portions of Finland, to combine rust resistance with sufficiently early ripening. This appears possible, as it is claimed that the investigation of crosses has shown that "the time of growth and the resistance to yellow rust in spring wheat are due to factors which inherit from one another independently, and that, under these circumstances, it is possible to combine good resistance to yellow rust and early maturing in the same spring wheat. In the crossings made by the author there are several plots in which this combination is apparent, and they are therefore very promising from a practical point of view. . . . The time of sowing does not essentially influence the susceptibility to rust . . . of spring wheat. In early as well as in late sowings the wheat is infected with about the same rapidity and to the same degree of rust which is characteristic of it."

It is stated that "in the cross of Extra Kolben×Prelude yellow rust diminishes the crop by 44.8–47.4 per cent on an average, or by about 6–9 per cent per rust unit. In the cross of Marquis×Hankkijan ruskea yellow rust diminishes the crop by 23.6–34.6 per cent, or by about 6–9 per cent per rust unit." It is claimed that "the clipping of the leaves at the time of heading diminishes the crop of rust-resistant and late varieties by nearly 50 per cent." It is deduced from experimentation and facts noted that "a very severe infection of rust affecting only leaves may lessen the yield of grain by 20–30 per cent."

The name of the take-all fungus: Changing scientific names (*Jour. Dept. Agr. So. Aust., 29 (1926), No. 9, p. 822*).—An explanation of certain changes in scientific names, under the rules of priority, notes certain complications leading to the restoration of the original name *Ophiobolus graminis* to the take-all fungus, which for a certain period bore the name *O. cariceti*.

"Take-all" investigations (*Jour. Dept. Agr. So. Aust., 27 (1923), No. 6*

wheat-growing areas of South Australia has led to arrangements for extended investigation of the disease, the main present lines of which are indicated with some practical results bearing upon its control. The recommendations include early burning of stubble, early fallowing, clean fallows (especially free from barley grass), rolling if necessary to compact seed beds, superphosphate at 1 cwt. per acre, and a wheat-oats-bare fallow, or wheat-oats-oats-bare fallow.

A new bacterial disease of alfalfa, F. R. Jones (*Phytopathology, 15 (1925), No. 4, pp. 243, 244*).—Enlarging diseased areas of alfalfa near Freeport, Ill., around Monroe, Wis., and at Madison, Wis., appeared to be due to the activity of the same vascular disease organism, a bacterium, supposedly new, and presumably a serious menace locally to alfalfa culture.

Black rot of cabbages and cauliflowers in South Australia, G. Samuel (*Jour. Dept. Agr. So. Aust., 28 (1925), No. 12, pp. 1071–1076, figs. 4*).—Black rot (*Bacterium campestre*) of cabbage, cauliflower, and other crucifers, said to have only recently come to the notice of the Department of Agriculture in South Australia (though serious in parts of Europe and North America), is noted as a seedborne disease requiring disinfection. A method is described along with a few other and related control measures.

A new disease of carrot [trans. title], DubIez (*Rev. Hort.* [*Paris*], *98 (1926), No. 11, pp. 276, 277*).—A disorder of carrots is noted as causing a leaf discoloration. The rootlets show the presence of *Asterocystis radicis*.

A preliminary study of fungous action as the cause of down corn, L. W. Durrell (*Phytopathology, 15 (1925), No. 3, pp. 146–154, figs. 4*).—The author devised a method for determining the breaking strength of cornstalks, and studied the relation of the strength of stalks to the fungi which had invaded them, of which *Diplodia zeae*, *Gibberella saubinetii*, *Basisporium gallarum*, and *Fusarium* sp. are named.

Cercospora leaf spot of lettuce, F. P. McWhorter (*Phytopathology, 15 (1925), No. 4, p. 247*).—The lettuce leaf spot organism described in 1923 by Welles as *C. lactucae* n. sp. (E. S. R., 54, p. 148) is said to have been described under the same name in 1917 by Stevenson.[3]

Root-rot of peas in the Middle Atlantic States in 1924, C. Drechsler (*Phytopathology, 15 (1925), No. 2, pp. 110–114*).—The results are given of a survey of pea fields in Maryland, Delaware, and New Jersey to determine the prevalence of root rot and the relative importance of the species of fungi which cause injury. While *Fusarium martii pisi*, *Pythium debaryanum*, *Corticium vagum solani*, and *Aphanomyces euteiches* were found, by far the most important primary cause of root rot was the last species mentioned.

Blossom-end rot of pepper (Capsicum annuum L.), B. B. Higgins (*Phytopathology, 15 (1925), No. 4, pp. 223–229, figs. 4*).—A blossom end spotting of pepper fruits, claimed to be physiological and said to have been mentioned previously only by the author (E. S. R., 49, p. 346), is described. The disease, which develops only on the half-grown fruits, is caused by drought following a period of rapid growth, the spots being initiated by the collapse of the large, thin-walled cells surrounding the ends of the vascular strands, and being afterwards invaded and enlarged by microorganisms.

Infection of potato tubers by Alternaria solani in relation to storage conditions, L. O. Gratz and R. Bonde (*Florida Sta. Bul. 187 (1927), pp. 165–182, figs. 9*).—Preliminary reports have been noted on *A. solani* as the cause of tuber rot in potatoes (E. S. R., 54, p. 651; 56, p. 246).

[3] Jour. Dept. Agr. Porto Rico, 1 (1917), No. 2, p. 105.

A detailed account is given of further investigations carried on at the Florida and Maine Experiment Stations which show that tubers are easily inoculated at digging time by stirring them about in foliage spotted with early blight. The leaves are usually blight infected at this time, and the commercial digger may serve as the inoculating agent. Covering the barrels standing in the fields with foliage, which is said to be a common practice, is another way of effecting inoculation. Bruising was found to aid infection but was not essential for it.

Storage conditions as they exist in October in Maine are said to be ideal for the development of this trouble. As the temperature of the storage houses decreases the dust-covered lesions become practically dormant, making it impossible to detect a large percentage of the minute spots when the stock is prepared for shipment to the South in December. The unobserved lesions were found to increase in size during transit and were from 2 mm. to 0.5 cm. or more in diameter on arrival at their destination. Under favorable conditions the lesions will continue to develop.

The authors state that it has not been demonstrated that outbreaks of early blight may result from the planting of infected seed pieces, but this is believed to be entirely possible.

Potatoes resistant to blight [trans. title], G. Bellair (*Rev. Hort* [*Paris*], *98* (*1926*), *No. 3*, *pp. 57, 58*).—Potato varieties found very resistant to late blight were Bravo and Rouge du Soissonnais; resistant, Pousse Debout, Fin-de-Siècle, Express, and Vitelotte; and somewhat resistant, Institut de Beauvais, Négresse, Royale, and Victor.

Potato canker in Silesia [trans. title], A. Piekarski (*Choroby i Szkodniki Roślin*, *1* (*1925*), *No. 4*, *pp. 1–11*, *fig. 1*; *Ger. abs.*, *p. 11*).—Localities, areas, totals, and degrees of potato canker infection are indicated.

New studies on stipple-streak disease of potato, D. Atanasoff (*Phytopathology*, *15* (*1925*), *No. 3*, *pp. 170–177*, *figs. 2*).—In a previous publication (E. S. R., 51, p. 545) the author described under the name stipple-streak a mosaic disease of the potato. Potato varieties susceptible to stipple-streak show widely differing susceptibility. Some varieties when infected by the disease show very slight symptoms, if any. Such varieties are considered as masked carriers of the disease under field conditions.

Wart disease of the potato: Infection tests (*Scot. Jour. Agr.*, *9* (*1926*), *No. 3*, *pp. 302–304*).—Experimentation to develop a practical method of testing the reaction of the potato to wart disease without having recourse to field tests was carried on during the winter of 1925–26. A simple method said to be capable of application to an unlimited number of varieties is outlined, with varietal results of infection tests and verifications. The infection by washings method is preferred to field tests in view of its simplicity and the fact that it can be repeated four or five times on the same variety or series of varieties between November and April.

Potato varieties and black wart [trans. title], V. Ducomet (*Prog. Agr. et Vitic.* (*Éd. l'Est-Centre*), *47* (*1926*), *No. 43*, *pp. 398–400*).—An attempt is made to point out and remedy some errors of synonymy of potato varieties, also to point out errors in listing varieties as susceptible, resistant, or immune to wart, in connection with color, shape, or other qualities.

A field test of mercuric chloride solutions in potato seed treatment, L. J. Cross (*Phytopathology*, *15* (*1925*), *No. 4*, *pp. 241, 242*).—To prevent error as to the actual strength of corrosive sublimate solution remaining after use to disinfect seed potatoes differing as to amount and nature of adhesive soil, decay, or rot, the author describes apparatus used and procedure followed in tests

said to have been made for four years under his direction. These tests are alleged to have secured a 90 to 100 per cent Rhizoctonia killing effectiveness in the treatment of some 50,000 bu. of seed potatoes.

[Sugar cane diseases and pests, Queensland] (*Queensland Agr. Jour., 25 (1926), Nos. 5, pp. 416, 417; 6, pp. 498–500; 26 (1926), Nos. 1, pp. 51, 52; 2, p. 115; 4, pp. 281, 282*).—Statements contained in a few of the monthly reports of N. L. Kelly show that one of the most important problems confronting cane growers in this region is control of cane diseases. These are in part indicated for districts found to be affected. Such diseases include mosaic (carried by *Aphis maidis*), gumming, foot rot, Fiji, iliau, knife cut, leaf stripe (*Sclerospora sacchari*), top rot, leaf scald (*Bacterium* sp.), red rot (*Colletotrichum falcatum*), and the cane-killing weed *Striga* sp. Favorable or unfavorable conditions and susceptible or resistant varieties are indicated, with other information and suggestions bearing on control.

Cane pests and diseases, N. L. Kelly (*Queensland Agr. Jour., 25, (1926), No. 6, pp. 498–501*).—Mosaic has spread into every cane-growing district in Queensland and New South Wales, and losses are considerable. It is spread by planting diseased sets, also by the cane aphid (*Aphis maidis*), which carries the virus in its mouth parts to infect healthy cane and to cause mosaic on maize, sorghum, Johnson grass, rat-tailed grass, wild millet, and summer grass. A report is given, according to districts visited, of plant diseases found therein.

Control of cane diseases, N. L. Kelly (*Queensland Agr. Jour., 25 (1926), No. 5, pp. 416, 417*).—This brief report discusses three broad measures for all major cane diseases, as eradication of infected fields, careful selection of seed, and the use of resistant varieties. Fiji disease (cause unknown) is described. It is carried in sets, possibly soil, and probably through infection in some way not yet determined. Susceptible varieties should be eliminated.

Notes and observations on the red streak associated with Queensland top rot disease, W. Cottrell-Dormer (*Queensland Agr. Jour., 25 (1926), No. 5, pp. 406–414, figs. 6*).—Preliminary notes are given of a rapid study (December 15, 1925, to January 6, 1926) into the nature of certain bright red streaks which appear in cane leaves, especially Badila (N. G. 15), about that time of year, and which are briefly described. It was found that the formation of red streaks can be induced by pricking or scratching sound leaf epidermis (either side) near the base with a needle which has been drawn through an active red streak on a naturally infected leaf, by use of a watery suspension of the bacteria from red streak in the field, or by secondary inoculation employing this method. Infection at the base of young leaves does not require injury. All symptoms of top rot can be produced by using potato slice cultures of red streak bacteria.

A new foot rot of the sweet potato, J. J. Taubenhaus (*Phytopathology, 15 (1925), No. 4, pp. 238–240, fig. 1*).—A sweet potato foot rot was noted in 1914 and 1915 at Seaford, Del., and again in 1919–1921 at Troup and Jacksonville, Tex. A similar trouble was found on tomato seedlings in cold beds. Reference is made to the tomato foot rot in Delaware and New Jersey noted in 1920 by Rosenbaum (E. S. R., 44, p. 647), and to the same or a nearly similar disease described by Pritchard and Porte (E. S. R., 45, p. 249) and supposed by them to be caused ordinarily by *Verticillium lycopersici*, or under certain conditions by *Macrosporium solani*.

An account is given of the production of typical foot-rot symptoms on tomato and sweet potato plants inoculated with a strain of Macrosporium isolated originally from either of these two hosts, the original fungus, moreover, being recovered from reinoculation cultures. The inoculation results as herein tabulated are said to show no discrepancy with those given by Rosenbaum.

Structure and cultural history of a mycetozoan found in tobacco plants with mosaic-like symptoms, P. M. Jones (*Bot. Gaz., 81 (1926), No. 4, pp. 446–459, pls. 4, figs. 2*).—This mycetozoan is provisionally placed in Plasmodiophora and named *P. tabaci* n. sp., though its mode of depositing spores is anomalous. Section of tobacco leaves from affected plants show the plasmodium stage. In culture, the mycetozoan has a flagellate and an amoeboid stage, forming gametes, plasmodia, free spores, and cyst spores. Inclusions found in the cyst may have a parasitic relation to the mycetozoan.

Susceptibility of Nicotiana species, varieties, and hybrids to tobacco wildfire, P. J. Anderson (*Phytopathology, 15 (1925), No. 2, pp. 77–84*).—Infection experiments were carried on with a considerable number of varieties of cultivated tobacco, as well as many species and hybrids, in an effort to secure data that would serve as a basis for the development of desirable kinds of tobacco that would be resistant to wildfire, caused by *Bacterium tabacum*.

None of the 41 varieties of *Nicotiana tabacum* appeared to possess high resistance to wildfire, though all varieties of *N. rustica* and *N. alata* which were tried, as well as of *N. repanda, N. nudicaulis*, and *N. attenuata* were highly resistant. *N. acuminata, N. Bigelovii, N. colossea, N. glutinosa, N. glauca, N. langsdorffii, N. longiflora, N. paniculata, N. plumbaginifolia, N. quadrivalvis, N. sanderae, N. suaveolens, N. sylvestris*, and *N. wigandioides*, though susceptible, vary widely in susceptibility. When the resistant *N. nudicaulis* and *N. alata* are crossed with the susceptible *N. tabacum* the resultant hybrids are resistant.

Verticillium wilt of tomato, M. K. Bryan (*Phytopathology, 15 (1925), No. 3, pp. 187, 188*).—The author reports having found a Verticillium wilt in tomato fields where only Fusarium was suspected, in some cases as high as 25 per cent of the plants being infected by a species resembling *V. albo-atrum*. This suggests that Verticillium may be causing loss at other points in northern tomato fields where low temperatures would retard Fusarium.

Wilt-resistant tomatoes, (*Queensland Agr. Jour., 25 (1926), No. 5, p. 473*).—J. T. Moore transmits, through N. A. R. Pollock, brief information regarding the production and increasing distribution of tomato seed which are said to be wilt-resistant, pure, and reliable, the varieties most favored being Bowen Buckeye and Denisonia.

Note on the bacterial soft rot of turnips, H. Wormald and R. V. Harris (*Ann. Appl. Biol., 12 (1925), No. 3, pp. 326–329*).—It is reported that in a private garden at East Malling a turnip soft rot starting at the crown (suggesting that the young leaves are primarily infected) and extending to the whole root (which was sometimes skeletonized) was caused by an organism having the same group number as *Bacillus carotovorus*.

Watermelon internal browning, W. W. Gilbert and E. Artschwager (*Phytopathology, 15 (1925), No. 2, pp. 119–121, fig. 1*).—Internal browning of watermelons, apparently comparable with the internal brown spot of potatoes and the Baldwin spot of apples, is described. The cause of this abnormal condition has not been determined, though a period of four or five weeks of dry weather which occurred while the melons were maturing is thought to have had some relation to the trouble.

The story of fire blight and its control, L. M. Massey (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 52–58*).—A very brief history is given of apple, pear, and quince fire blight in America since its first description as noted in the Hudson River Highland in 1794. Accounts are given of varietal susceptibility and control measures. Practical considerations for fruit growers are presented in some detail.

Serious blossom blight in Pacific Northwest orchards due to a species of

British Columbia, western Washington, western Oregon, and probably southward, much loss is caused by blossom blight and spur killing, sometimes with branch and twig cankering and girdling and slight fruit rot due to a Monilia similar to *Sclerotinia cinerea*, but differing as to life history, growth characters, and spore morphology. The name *M. oregonensis* has been assigned to the fungus. Apricots, sour cherries, sweet cherries, prunes, peaches, and pears are the principal hosts, though quince and apple fruits have been infected. The fungus winters locally, producing olivaceous spore tufts in winter and spring. Apothecia are unknown and were not produced by favorable conditions in *S. cinerea*.

Stationary spraying plants for the orchard, J. A. CAMPBELL (*New Zeal. Jour. Agr., 31 (1925), No. 5, pp. 279–285*).—Presentation is made, with discussion, of separate reports in some detail, from J. H. Thorp and G. Stratford, as to stationary spraying plants in the Nelson Province.

Mineral oils in copper fungicides for winter sprays of fruit trees [trans. title], A. PAILLOT (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 46 (1925), No. 43, pp. 405, 406*).—The use of an emulsion of mineral oil in a copper spray for winter application to fruit trees, according to a formula given in 1923, is said to give results which are constant and satisfactory. For this purpose, oils of fluid or semifluid character, about as used for the lubrication of automobiles, are particularly recommended.

Field trials of spray materials on apples in 1925, E. V. SHEAR, JR. (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 145–150*).—During 1925 considerable Bordeaux mixture was used as the summer spray against apple bitter rot, with but moderate or slight injury to apples. Sulfur sprays, however, seem better adapted, being cheaper and more easily used. Diluted commercial lime sulfur, Jersey dry mix sulfur and lime, atomic sulfur, vegetable sulfur, and colloidal sulfur all appear to be satisfactory. Details are given regarding several treatments for apple scab. Soluble sulfur appears promising, as does colloidal sulfur after one year's trials in combination with oil. These materials are more easily used than Bordeaux.

Apple blotch in New York State, H. E. THOMAS (*Phytopathology, 15 (1925), No. 4, pp. 246, 247*).—The discovery of apple blotch (*Phyllosticta solitaria*) in April, 1924, at Williamson and in July, 1924, at Geneva supposedly constituted the earliest findings of this disease in New York State, though it is admittedly possible that introductions may have occurred some years earlier due to a practice of purchasing nursery trees from the Middle West.

A rot of apples caused by *Botryosphaeria ribis*, E. A. FENNER (*Phytopathology, 15 (1925), No. 4, pp. 230–234*).—Currant canes inoculated with a mycelium from apples collected in widely separated regions show a disease apparently identical with that caused by *B. ribis chromogena*. Its identity and its pathogenicity are regarded as established.

Effect of soil treatment with sulphur upon crown gall in nursery apple trees, C. D. SHERBAKOFF (*Phytopathology, 15 (1925), No. 2, pp. 105–109, figs. 3*).—Sulfur at the rate of about 600 lbs. per acre was used in nursery rows, and a preliminary report is given of the results.

From data obtained with 1-year-old trees, it appears that, except in case of Early Harvest, not enough crown gall developed on the trees in the untreated rows to warrant a conclusion as to the treatment. With Early Harvest evidence is strong that the treatment is very effective in the control of the disease.

A preliminary note on the perithecia of *Nectria galligena*, W. A. R. D. WESTON (*Ann. Appl. Biol., 12 (1925), No. 3, pp. 398–400, figs. 2*).—In March, the perithecia of *N. galligena* were found by the author on a shriveled apple still ad-

hering to the tree. Other specimens were obtained by examination of 700 shriveled apples in the same orchard. On one, practically three-fourths of its surface was studded with the winter stage of the fungus, the perithecia being fully mature and the asci liberating ascospores. Worcester Pearmain apples in this orchard showed a moderately severe attack of canker, young spurs and leaders being girdled. It is suggested that the formation of perithecia on shriveled apples may also have taken place elsewhere, and that this may be a method of overwintering by the fungus which has not been previously noted.

Some relations of environment to the epidemiology and control of apple scab, G. W. Keitt (*Natl. Acad. Sci. Proc., 12 (1926), No. 2, pp. 68–74, fig. 1*).—Studies with apple scab (*Venturia inaequalis*) concerning its variation from year to year as to severity and difficulty of control and concerning the development of adequate control measures have been directed along the line of field studies regarding the relation of the natural environment to the development and control of the disease, also along the line of laboratory and greenhouse studies of the development and prevention of the disease under conditions in which certain factors of the environment were controlled. The development and conduct of these studies is briefly shown in the present article.

The most noteworthy results herein recorded are that commercial lime sulfur and sulfur dust, in the concentrations ordinarily used in practice, prevented apple leaf infections by ascospores of *V. inaequalis* at 6° C., the lowest temperature tried, and that, under the conditions of these experiments, the sulfur fungicides named were consistently more effective than the standard copper spray, 4–4–50 Bordeaux mixture. The studies thus far indicate that the marked variations which commonly occur in the development and control of apple scab are to be attributed largely to fluctuations in moisture and temperature, acting chiefly in relation to the development of the causal organism (particularly by influencing the timeliness and abundance of spore production and the conditions for infection at critical stages of host development), and the development of the host (particularly by influencing the time required to pass through its stages of maximal susceptibility), and in relation to the efficiency of fungicides.

Apple scald, J. Oskamp (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 191–196*).—A somewhat general account is given of apple scald, declared to be more destructive than all other nonparasitic storage diseases combined, with an account of experimentation showing that the larger fruits scalded worse than the smaller, regardless of the treatment; that the use of 1.5 lbs. per barrel of either oiled wrappers or shredded oiled paper markedly reduced storage scald; and that, in equal amounts by weight, shredded oiled paper gave fully as good control as did oiled wrappers.

A pear tree canker, G. Samuel (*Jour. Dept. Agr. So. Aust., 27 (1924), No. 9, pp. 880–884, figs. 4*).—It is stated that, though South Australia is peculiarly free from fruit-tree canker diseases, one type of canker occurs occasionally on both apples and pears. The symptoms are described. A Coniothecium, the only fungus found in this connection, does not attack the fruit, and does not correspond precisely to the fungus named *C. chomatosporum* and described as causing an apple branch canker and fruit scabbing and cracking in South Africa, Europe, and New Zealand.

Biological and cultural studies of Exoascus mirabilis, A. J. Mix (*Phytopathology, 15 (1925), No. 4, pp. 214–222, figs. 2*).—A disease of the Chicasa plum (*Prunus angustifolia*) is said to be common in eastern Kansas and to yield the fungus *E. mirabilis* from the ascospore-bearing surfaces and from the interior of the diseased shoots. The culture colonies are very similar to those of *E. deformans*. Phases of the biology and physiology of the organism are

outlined. Artificial inoculation has thus far failed. Dormant spraying controls the disease. It is thought that overwintering mycelium is lacking or unimportant; that infection is due to overwintering spores (conidia?); that infections may occur over a considerable period in the spring; and that only the growing tips of shoots are susceptible.

The weather and peach leaf curl in eastern Kansas in 1924, A. J. Mix (*Phytopathology, 15 (1925), No. 4, pp. 244, 245*).—The present note supplements the account above noted by recording the effect of the spring weather of 1924 on the occurrence and development of peach leaf curl. From evidence presented it is concluded that infection of peach leaves by overwintering spores of *Exoascus deformans* may occur not only when the buds open but also after the leaves are considerably expanded, and that the peach leaf as it grows older is more capable of resisting the deforming effect of the fungus.

Fusarium rot of the peach, A. G. Plakidas (*Phytopathology, 15 (1925), No. 2, pp. 92–98, figs. 6*).—Peach Fusarium rot is reported to occur in California. Three forms were isolated from decaying peaches sent from Sutter County. According to Sherbakoff (E. S. R., 33, p. 849), these correspond to *F. asclerotium*, *F. solani*, and *F. pirinum*. Pure culture inoculations produced rot on fruit (peaches and oranges) and on peach and apricot buds under laboratory conditions, but failed to produce bud rot on growing peach and apricot trees under spring field conditions at Berkeley.

Rhizopus rot of peaches, H. W. Anderson (*Phytopathology, 15 (1925), No. 2, pp. 122–124*).—From a study of data on the inspection of shipments of peaches received at different markets, it was found that in three years' shipments from Illinois to 10 widely separated markets Rhizopus rot was more frequent than brown rot. It is recommended that more attention be given to this rot, and that a study be made of methods of control in transit and storage, in which great losses are being experienced.

Field observations on false blossom of the cultivated cranberry, N. E. Stevens (*Phytopathology, 15 (1925), No. 2, pp. 85–91*).—Field observations indicate that cranberry false blossom has spread on certain bogs in Massachusetts and New Jersey since its discovery there 10 years previously. Eastern varieties are infected. The disease maintains itself under good cultural conditions, and it is suggested that it be treated as infectious until the cause is definitely established.

A note on the leaf spot disease of black currants, H. R. Beiton-Jones (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1925, pp. 105–108*).—Black currant leaf spot disease was very prevalent throughout the western counties in 1924, this corresponding to the heavy rainfall. In some localities, however, bushes were almost free from the disease. In 1925 leaf spot was considerably less than in 1924. In both years the variety Baldwin was injured much more than such varieties as Seabrook Black and Boskoop Giant.

The difference in the hard-pruned Baldwins and the light-pruned Baldwins suggests a ready and simple means of controlling the leaf-spot disease. Presumably any operation which tends to increase the vigor of the bush will also be reflected in a reduction in the amount of disease.

American gooseberry mildew [trans. title], L. Garbowski and P. Leszczenko (*Choroby i Szkodniki Roślin, 1 (1925), No. 4, pp. 12–21; Fr. abs., p. 20*).—Sodium arsenate or arsenite in weak solutions (0.01–0.02 per cent) is said to afford sufficient protection against American gooseberry mildew (*Sphaerotheca mors uvae*).

Some facts about loganberry "dwarf," S. M. Zeller (*Phytopathology, 15 (1925), No. 2, p. 125*).—Loganberry dwarf, resembling in many ways bramble

streak in blackberries in the East, shows short internodes, several small buds at each node, and small, slightly yellowed obovate leaflets, but no streaking. Transmission has not been demonstrated. Affected tips do not root.

Raspberry mosaic control in the Hudson River Valley, W. H. RANKIN (*N. Y. State Hort. Soc. Proc., 71 (1926), pp. 173–178*).—Reviewing recent attempts to control raspberry mosaic by employment of varieties at least measurably resistant and otherwise desirable, the author states that those who desire to grow raspberries without giving attention to mosaic control will probably profit best by using the variety Latham. It is stated that it will not pay to attempt by roguing to keep this variety free from mosaic. Herbert and St. Regis resist mosaic better than other standard varieties. Other varieties named as probably desirable in this connection are Cuthbert, June, Ontario, and the new variety, Newman.

A case of Verticillium wilt (blue stem) of black raspberry in Oregon, S. M. ZELLER (*Phytopathology, 15 (1925), No. 2, pp. 125, 126*).—Plum Farmer black raspberries on land planted to potatoes the previous year showed 52 per cent dead or dying in the late fall of 1923–24. Cultures of a strain of *V. alboatrum* were obtained from 49 of 51 of the affected Plum Farmer plants. Mungers on like soil not planted to potatoes were doing well after five years.

Some observations on strawberry eelworm, L. N. STANILAND (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1925, pp. 61–65, fig. 1*).—Some details are recorded of a preliminary infection experiment with *Aphelenchus* sp. on strawberry, including the technique, the breeding of Aphelenchus under artificial conditions, and tests of the presence of Aphelenchus in the soil.

The study of esca [trans. title], L. RIVES (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), Nos. 14, pp. 323–328, figs. 2; 15, pp. 347–353, figs. 2; 17, pp. 395–401*).—A statement is given, with comparative discussion, of studies on esca, a condition of impaired or destroyed wood found chiefly in older vineyard stocks. The author has previously noted (E. S. R., 48, p. 149) the presence, in regions near Toulouse, of the perfect form of *Stereum hirsutum* in connection with stocks which have died following the development of esca.

A comparative discussion is given of a somewhat similar, or perhaps related, condition developing notably in oak in connection with *Phellinus igniarius*.

Observations on the injury done by *S. hirsutum* is thought to show that esca is a form of so-called apoplexy, due not so much to a lack of equilibrium between transpiration and root absorption as to a constraint or limitation in the access of crude sap to the leaves. Treatments presented in tabular and other detail show *S. hirsutum* to be very sensitive to soluble arsenic salts, which may also stimulate vegetative growth in the stocks.

Grape leaf scorch [trans. title], L. RAVAZ (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), No. 9, pp. 197–203, figs. 3*).—A leaf scorch of grapevines is described in connection with possible agencies, seasonal, meteorological, or parasitic. *Botrytis cinerea* is frequently found, and *Pseudopeziza tracheiphila* is also mentioned. The success of copper treatments in 1925 is noted.

Downy mildew, Plasmopara viticola, [of grapes], D. G. QUINN (*Jour. Dept. Agr. So. Aust., 27 (1924), No. 6, pp. 540–546, 548–550, figs. 3*).—A short history of grape downy mildew in various parts of Australia since its first recorded outbreak (1917) is given, with a general account of the disease and its management as noted locally and of the causal fungus (*P. viticola*). Bordeaux mixture is preferred to Burgundy mixture for combating grape downy mildew or any endophytic fungus.

Alkaline polysulfides for grape Oidium and downy mildew [trans. title], L. CAPITOUL (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), No. 18, pp.*

425-427).—Experimentation since 1906 with alkaline polysulfides in sprays for grape Oidium and downy mildew has given good results as regards effectiveness and economy. Attention is called to the Vermorel sprayers, in which the metal parts are not attacked by polysulfides. Formulas are given.

Potassium permanganate for grape Oidium [trans. title], V. VERMOREL (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 46 (1925), No. 30, pp. 80-83, figs. 3*).—Potassium permanganate is recommended for use against Oidium in connection with milk of lime or Bordeaux mixture.

Winter treatment for Oidium [trans. title], L. RAVAZ (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 46 (1925), No. 48, pp. 509-515*).—Information obtained from different sources is given with discussion.

Grape rougeot or rougeau [trans. title], H. FAES and M. STAEHELIN (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 47 (1926), Nos. 45, pp. 447-451, pl. 1; 46, pp. 474-479; 47, pp. 497-500*).—The rougeot or leaf scorch described as found in the Midi, France, is said to be physiological and essentially different from that found in parts of Switzerland and claimed by Müller-Thurgau (E. S. R., 30, p. 452) to be due to a fungus, *Pseudopeziza tracheiphila*.

In 1924, favored by the spring weather conditions, the parasitic red scald developed extraordinarily in Switzerland, France, and neighboring territory. The disease is practically controllable with appropriate sprays.

Early sprayings for grapevine diseases [trans. title], G. HÉRON (*Prog. Agr. et Vitic. (Éd. l'Est-Centre), 46 (1925), No. 44, pp. 421-423*).—Local conditions and needs are indicated as regards sprayings to combat early outbreaks of grape diseases.

Bunchy top in bananas: Final report of investigation committee, E. J. GODDARD, C. J. P. MAGEE, and H. COLLARD (*Queensland Agr. Jour., 25 (1926), No. 6, pp. 506-510*).—The final report of this committee (E. S. R., 56, p. 354) states that banana bunchy top has been definitely proved to be transmitted from diseased to healthy plants by the banana aphid (*Pentalonia nigronervosa*). Control of the disease is said to depend upon its exclusion from clear areas or its eradication from lightly infected areas, as no remedial or other protective measures and no immune stocks are available. Suggested legislation is outlined.

The anthracnoses of citrus fruits, mango, and avocado, J. A. B. NOLLA (*Jour. Dept. Agr. Porto Rico, 10 (1926), No. 2, pp. 25-50, pls. 6*).—A comparative study is presented of anthracnoses of mango, avocado, and citrus fruits to determine the causal relations of *Colletotrichum gloeosporioides*, *Gloeosporium limetticolum*, and possibly other species of fungi to these diseases.

It is stated that *C. gloeosporioides* appears to be the cause of the anthracnose diseases of mango, orange, grapefruit, lemon, avocado, and sometimes of lime. Lime wither-tip may be caused by either *C. gloeosporioides* or *G. limetticolum*. *C. gloeosporioides* frequently causes spotting of lime blossoms and wither-tip, also spotting on lime thorns. *G. limetticolum* causes wither-tip, leaf spot, fruit canker, and fruit spot of limes. Under artificial conditions the various cultures of *C. gloeosporioides* and *G. limetticolum* exhibit distinct cultural characteristics, which are indicated.

Epiphytic orchids a serious pest on citrus trees, M. T. COOK (*Jour. Dept. Agr. Porto Rico, 10 (1926), No. 2, pp. 5-9, figs. 8*).—In July, 1925, and more recently attention was called to the occurrence of two epiphytic orchids growing in destructive abundance on citrus trees, *Ionopsis utricularioides* and *Leochilus labiatus*. Both are described in connection with the injury caused, which is much greater in case of *I. utricularioides*.

The control of these plants consists simply in removing them and in some cases also heavily infected branches. It is not necessary to remove all of the roots, as the plants start from seeds and not from branching root systems.

The citrus scab fungus, A. E. JENKINS (*Phytopathology, 15 (1925), No. 2, pp. 99–104, figs. 4*).—A study of the citrus scab fungus usually referred to as *Cladosporium citri* has shown that the cause of the scab is not a Cladosporium, but is a species of Sphaceloma, which is named *S. fawcettii* n. sp. A technical description of the organism is given, and some of its characters are contrasted with species which cause anthracnose of grapes and raspberries.

Recent observations on die-back of lemon in Messina [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 6 (1926), No. 3, pp. 209–212, fig. 1*).—In the commune of Santa Teresa di Riva, a die-back or drying out of lemon branches is often associated with the presence of Colletotrichum, which is asserted to be favored by conditions prevailing near wounds, particularly acidity. In this connection it is stated that *C. gloeosporioides* is favored by a pH of 5.5–4.0.

The "mahali" disease of coconuts in Malabar, S. SUNDARARAMAN and T. S. RAMAKRISHNAN (*India Dept. Agr. Mem., Bot. Ser., 13 (1924), No. 4, pp. 87–97, pls. 2, fig. 1*).—In parts of Malabar, Kanara, and Mysore, the areca-nut palm has borne a disease called "mahali" or "koleroga," which causes the nuts to rot and fall off from the bunches and in extreme cases affects the crown of the palm itself. A disease resembling this in several respects has recently been noticed affecting the coconut trees in certain parts of Malabar, and, on account of the similarity, this disease is also called mahali. It was first noticed in 1922 after the heavy southwest monsoon, in a garden at Perambalai Amsam (Cochin State) bordering on Challeseri (Ponnani Taluk). Nut fall was reported in 1923. Mahali disease was severe on areca-nut palms, and in most gardens the coconut palms also suffered. The nut fall here noted is associated with the presence of a fungus believed to be identical with *Phytophthora omnivora arecae*. The fall of young and nearly mature nuts is heavy during the southwest monsoon. The disease appears on coconut only where this is interspersed with areca nuts and where these show koleroga. Bordeaux mixture has proved adequate to prevent nut fall.

A supposed root disease of coconut [trans. title], E. F. S. SHEPHERD (*Rev. Agr. Maurice, No. 21 (1925), pp. 482–484*).—Late in March, 1925, attention was drawn to a disease at Pointe aux Sables of a coconut tree disease previously unknown in Mauritius, apparently associated with root conditions which are described in connection with the presence of a fungus said to be a Botryodiplodia. Apparently, the infectious agent can travel in the soil.

Scab of Christmas berry, Photinia arbutifolia Lindl., due to Fusicladium photinicola n. sp., R. L. MCCLAIN (*Phytopathology, 15 (1925), No. 3, pp. 178–182, figs. 2*).—An account is given of a scab disease of the California Christmas berry caused by the fungus *F. photinicola* n. sp.

Gloeosporiose of Cyclamen persicum in Italy [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 6 (1926), No. 3, pp. 241–250, figs. 6*).—An account of fungi found on *C. persicum* in Italy concludes with a technical description of a fungus claimed to be new and named *Gloeosporium cyclaminis*.

Investigative work on white pine blister rust in the Pacific Northwest for 1923, J. S. BOYCE (*Phytopathology, 15 (1925), No. 2, p. 125*).—During 1923 circumstances indicated that white pine blister rust can spread directly from western white pine to Ribes at least 110 miles. No conclusive evidence was obtained of overwintering on Ribes. In these distant areas, initial infection

ECONOMIC ZOOLOGY—ENTOMOLOGY

Mammals and birds of Mount Rainier National Park, W. P. TAYLOR and W. T. SHAW (*Washington: U. S. Dept. Int., Natl. Park Serv., 1927, pp. X+249, pl. 1, figs. 109*).—Following a brief account of the organization of the work on Mount Rainier and the physiography of the region, the authors deal with the communities of mammals, birds, and plants, their life zones, habitats, and associations. The life zones are illustrated by a large colored map prepared by the senior author. A discussion of the need for a game preserve adjacent to Mount Rainier National Park and of how and where to become acquainted with the mammals and birds is followed by detailed accounts of the mammals (pp. 26–126) and birds (pp. 127–241) met with.

The meadow mouse (Microtus arvalis Pall.) and its destruction [trans. title], R. REGNIER and R. PUSSARD (*Min. Agr.* [*France*], *Ann. Épiphyties, 12* (*1926*), *No. 6, pp. 385–535, pls. 6, figs. 13*).—This is a monographic account of *M. arvalis*, in which particular attention is given to its biology (pp. 417–456) and control measures (pp. 457–514). A bibliography of 4 pages is included.

Notes on the ground-squirrel, *Callospermophilus*, R. T. HATT (*Mich. Univ., Mus. Zool. Occas. Papers, No. 185* (*1927*), *pp. 22, pl. 1, figs. 2*).—This account deals particularly with the life history and bionomics of *C. lateralis lateralis* and its subspecies *arizonensis*. Field studies were made in the foothills and along the front range of the Rocky Mountains of Colorado from Pike's Peak north to the vicinity of Nederland, Boulder County. Notes on *C. l. arizonensis* were made at its type locality, the San Francisco Mountains of Arizona. *C. l. saturatus* was observed near the type locality at Lake Keechelus, Wash.

The sparrow, C. J. CRAIG (*Jour. Dept. Agr. West. Aust., 2. ser., 4* (*1927*), *No. 1, p. 74*).—A brief account of the English or house sparrow, estimated to cause damage to the extent of £100,000 per annum in South Australia alone.

Nest-stealing tactics of the starling, G. M. SUTTON (*Bird Lore, 29* (*1927*), *No. 4, pp. 251–254, fig. 1*).—The author reports observations of the habit of the starling of destroying the eggs and young of the flicker and mourning dove.

[Economic insects and their control] *N. Y. State Hort. Soc. Proc., 71* (*1926*), *pp. 4–154*).—Papers presented at the Rochester, N. Y., meeting in January, 1926, include the following: Some Long-Standing and Some More Recent Insect Pests with Hints on Methods of Control, by G. W. Herrick (pp. 4–18); The Peach Cottony Scale, by J. P. Parrott (pp. 23–29) (E. S. R., 56, p. 257); Sources of Nicotine for Insecticide Use, by R. W. Thatcher (pp. 30–37); and Controlling Fruit Flies in Cherry Orchards, by P. J. Parrott (pp. 130, 131). Papers presented in Poughkeepsie, N. Y., in February, 1926, include Some Insect Pests of the Hudson Valley, by F. G. Mundinger (pp. 142–144), and Factors Affecting Insect Control, by E. P. Felt (pp. 150–154).

[Reports upon economic insects in New York] (*N. Y. State Hort. Soc. Proc., 72* (*1927*), *pp. 4–13, 26–38, 138–145*).—Papers relating to economic entomology, here presented, include the following: A Survey of Important Insects and Spray Developments, by P. J. Parrott (pp. 4–13); Lubricating-Oil Emulsion, by B. A. Porter (pp. 26–38); and Some Experiments Relative to Insect Control, by F. G. Mundinger (pp. 138–145).

[Economic insects in Tennessee] (*Tenn. State Hort. Soc.* [*etc.*] *Proc., 22* (*1927*), *pp. 39–44, 100–106, 112–115*).—The papers relating to economic insects in Tennessee include the following: Control of the Codling Moth, by A. J. Ackerman (pp. 39–44); Inducing Bees to Work with Greater Energy, by G. S. Demuth (pp. 100–106); and Report on Beekeeping Conditions, by W. L. Walling (pp. 112–115).

[Agricultural pests in Yorkshire in 1926], W. E. COLLINGE (*Yorkshire Agr. Soc. Trans., 84 (1926), pp. 5–17, figs. 2*).—A brief account of the more important insect pests of the year and means of control.

Some important economic insects of central Europe, R. T. WEBBER (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 301–310*).—A discussion of several forest insects of economic importance observed in central Europe during the course of an inspection trip.

Some comparatively new apple insect pests in California, A. D. BORDEN (*Pan-Pacific Ent., 3 (1926), No. 2, pp. 91, 92*).—The author reports that in Santa Cruz County the insect-bitten or defective fruit ranges from 30 to 60 per cent of the total crop in many apple orchards. This defect is largely due to the western tussock moth, skin worm (*Argyrotaenia franciscana* Wals.), and fruit tree leaf roller injury. In some sections the western tussock moth has developed a prolonged hatching period, from February to August. The fruit tree leaf roller and a new tortricid (*Pandemis pyrusana* Kearf.) caused more than 50 per cent of the defect, the tortricid, which is by far the most injurious, having two broods.

Forest entomology, O. NÜSSLIN, rev. by L. RHUMBLER (*Forstinsektenkunde. Berlin: Paul Parey, 1927, 4. ed., rev. and enl., pp. XVI+625, figs. 490*).—A revised and enlarged edition of the work previously noted (E. S. R., 48, p. 252).

Some of the important forest insects of western Europe, S. M. DOHANIAN (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 310–316*).—Several insects attacking the oaks and pines in the forests of western Europe are mentioned, together with their life histories and methods of control.

Host-parasite relations between man and his intestinal protozoa, R. HEGNER (*New York and London: Century Co., 1927, pp. XIII+231, pls. 4, figs. 2*).—Chapter 1 of this work deals with the biology of host-parasite relations between man and his intestinal protozoa, chapter 2 with intestinal amebas, chapter 3 with intestinal flagellates, chapter 4 with intestinal infusoria, and chapter 5 with coccidia. A 25-page list of references is included.

Researches in Polynesia and Melanesia.—Parts I–IV, Entomology, P. A. BUXTON and G. H. E. HOPKINS (*London: London School Hyg. and Trop. Med., 1927, pp. XI+260, pls. 12, figs. 43*).—The first four parts of this work here presented, relate principally to medical entomology. Part 4 (pp. 125–220) reports upon experiments performed on *Aedes variegatus* and *A. argenteus*. Is There a General Factor Tending to Cause Eggs of *A. variegatus* in Different Experimental Pots to Hatch on Certain Days? is discussed in an appendix by J. F. C. Haslam (pp. 238–240), as is the Distribution of Hatching Times of *A. variegatus* by M. Greenwood and E. M. Newbold (pp. 241–251).

The treatment of insect-infested chestnuts by boiling water [trans. title], K. HASEGAWA (*Forest Expt. Sta. [Japan] Bul., 1 (1925), No. 1, pp. 35–38; Eng. abs., p. 38*).—The author finds that chestnut-infesting insects, including *Balaninus camelliae* Roel, *Laspeyresia* sp., and *Dichocrocis punctiferalis* Guen. can be killed without affecting the germination of the chestnuts by dipping them in boiling water for a period of from 20 to 25 seconds.

Cyanide dust fumigation, H. J. QUAYLE (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 200–203*).—This is a contribution from the California Citrus Experiment Station which deals with the use of cyanide dust in citrus fumigation.

Adapting fumigation procedures to industrial needs, V. I. SAFRO (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 261–267*).—This is a discussion of some of the basic principles, including dosage range, air circulation during fumigation, penetration, retention, and a correction of some former ideas on absorption of hydrocyanic acid gas by foodstuffs.

Insect revival after fumigation, J. C. HAMLIN and W. D. REED (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 400–428*).—Saw-toothed grain beetle adults and the Indian-meal moth larvae fumigated with carbon disulfide at atmospheric pressure revive under certain conditions as much as 10 and 15 days, respectively, after treatment. Several larvae of the latter species which revived a week or more after fumigation subsequently emerged as adults. With these species, under the conditions outlined, accurate results can not be secured by final examination 24 to 48 hours after fumigation.

Tests of some recently developed insecticides in control of the grape leafhopper and oriental fruit moth, J. R. EYER (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 253–261*).—This is a report of results of insecticide investigations conducted during the course of several years.

In tests on the grape leafhopper, pyrethrum soap emulsion killed the nymphs equally as well as nicotine sulfate and prevented the hatching of eggs. Derrisol also killed the nymphs, but was not so effective as an ovicide. Sodium fluosilicate killed the nymphs but burned grape foliage unless combined with hydrated lime or Bordeaux mixture. Combinations of these materials with Bordeaux mixture did not seem to affect their toxicity to leafhopper nymphs.

With the oriental fruit moth pyrethrum soap emulsion combined with sodium fluosilicate and Bordeaux mixture was very effective in preventing larvae from entering the fruit. A dust of pyrethrum powder, hydrated lime, and sodium fluosilicate was also quite effective, and sodium fluosilicate combined with hydrated lime and used as a spray or dust killed a large percentage of the larvae. In field tests sodium fluosilicate-lime dust, and pyrethrum soap emulsion with Bordeaux mixture were superior to arsenicals and nicotine in reducing the percentage of wormy fruit.

Preliminary notes on the toxicity of some standard insecticides under Ceylon conditions, G. D. AUSTIN (*Ceylon Dept. Agr. Yearbook, 1927, pp. 49–53*).—The experiments reported relate to lead chromate, lead arsenate, Paris green, magnesium arsenate, and sodium silicofluoride or sodium fluosilicate.

The arsenic content of sprayed apples, A. HARTZELL and F. WILCOXON (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 204–212, fig. 1*).—In the investigations here reported individual analyses of 47 apples from trees sprayed according to the standard schedule comprising 5 applications of lead arsenate (4 lbs. to 150 gals.) at Yonkers, N. Y., during the season of 1926, gave an average of 0.173 mg. of arsenic trioxide per kilogram of fruit and a maximum of 0.704 mg. per kilogram. The limit allowed by the Royal Commission of Arsenical Poisoning in 1903 was 1.429 mg. per kilogram of foodstuffs. There was between 17.85 and 19.51 in. of rainfall from the time the first spray was applied until the date the fruit was picked. Analyses of cider (50 cc.) and jelly (30 gm.) made from apples from this experiment showed arsenic in such minute quantities that the determinations did not differ from the blanks of the reagents by any measurable amounts.

Oil sprays: Their use and effectiveness in control of fruit-tree leaf-roller, oyster-shell scale, and blister-mite (under interior conditions of B. C.), H. H. EVANS (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 68 (1927), pp. 11, figs. 8*).—This is a practical summary of information.

Report on oil emulsions, J. J. DAVIS ET AL. (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 229–235*).—A subcommittee of the American Association of Economic Entomologists here reports upon the effect of oil emulsions upon insects and plants and upon chemical and other problems.

Report of the subcommittee on insecticide machinery, F. H. LATHROP ET AL. (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 223–229*).—A subcommittee of the

American Association of Economic Entomologists here reports upon the location of research projects on insecticide machinery, a self-mixing duster, economics of spraying operations, standardization of spray machinery, stationary spray outfits, and new developments.

"Cold steam" spraying machines, R. W. Leiby (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 281–284, pls. 2*).—Descriptions are given of orchard and field crop sprayers that break up a spraying liquid by steam generated in a steam boiler. A 5-h. p. boiler generates steam with a gasoline burner as a source of heat. It is stated that from 80 to 100 lbs. of steam pressure will break up a spraying liquid to the fineness of steam itself at the nozzle, the steam passing through a separate lead of hose and meeting the spraying liquid at the nozzle. Any degree of fineness or coarseness of the spray can be secured by regulating the amount of steam allowed to pass through the nozzle.

Termites modify building codes, T. E. Snyder (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 316–321, pls. 4*).—This is a discussion of the modification of building codes made necessary by the work of termites.

The Florida potato plant-bug, F. H. Chittenden (*Fla. State Plant Bd. Quart. Bul., 11 (1927), No. 3, pp. 115–118, figs. 2*).—An account of *Corecoris diffusus* Say, a large plant bug which attacks potato and wild Solanum in Florida.

Paradichlorobenzene against the black peach aphis, Anuraphis persicae-niger Smith, C. R. Cutright (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 250–253, fig. 1*).—Field experiments conducted at the Ohio Experiment Station over a period of four years show that paradichlorobenzene can be used safely and effectively in combating this aphid.

The green bug in Minnesota, A. G. Ruggles and F. M. Wadley (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 321–327, fig. 1*).—In this contribution from the Minnesota Experiment Station it is reported that some 15,000,000 bu. of oats were destroyed by the green bug in that State in 1926, a cool dry June having been favorable to its development. It appears, however, that this aphid did not overwinter in Minnesota, but was blown in by the wind.

The bean aphis, J. Davidson (*Jour. Min. Agr. [Gt. Brit.], 32 (1925), No. 3, pp. 234–242, pls. 2*).—This is a report of a biological study of *Aphis rumicis* L. conducted at the Rothamsted Experimental Station.

A preliminary report on a grass-root mealybug (Ripersia radicicola Morrison) affecting sugar cane in Cuba, C. F. Stahl (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 392–399, pl. 1, fig 1*).—An account of a typical root-feeding mealybug (*R. radicicola* Morr.) which was found well distributed over the island of Cuba on the roots of grasses and sugar cane.

An outbreak of the red-striped sugar-cane scale, H. L. Dozier (*Jour. Dept. Agr. Porto Rico, 9 (1925), No. 4, pp. 357–367, figs. 4*).—A brief account of *Pulvinaria iceryi* Guér., a serious outbreak of which occurred on sugar cane near Arecibo, P. R., in 1925. A discussion of its natural enemies includes a description of *Aphycus (Euaphycus) flavus* How., *Cheiloneurus pulvinariae* n. sp., and *Anerisius ceroplastae* How.

Airplane dusting experiment for gipsy moth control, D. F. Barnes and S. F. Potts (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 213–222, fig. 1*).—This is a report of experiments conducted in 1926 with airplanes as a means for dusting forest areas in New England. The paper deals with the infestation treated, the control secured, the poison distribution, and the relation of topographical and meteorological factors to the results secured. In all cases the treated plots showed much less defoliation than the untreated checks, the greatest differences being found in the case of plots dusted when the larvae were small.

[Experimental work with the silkworm], Y. UMEYA (*Chosen Govt. Gen. Seric. Expt. Sta. Bul. 1 (1926), pp. 48, pls. 4, fig 1*).—Two papers are here presented, one on Experiments of Ovarian Transplantation and Blood Transfusion in Silkworms, with Special Reference to the Alternation of Voltinism (pp. 1–26) and the other on Studies on the Silkglands of the Silkworm (pp. 27–48).

Ellopia athasaria Walk., a looper attacking hemlock, J. S. HOUSER (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 299–301*).—This is an account of a geometrid which appeared in hordes in 1925 attacking hemlock in eastern Ohio, but which disappeared in 1926, probably as a result of the work of the fungus *Sporotrichum globuliferum* attacking the overwintering pupae.

The control of the hemlock spanworm by airplane dusting, S. B. FRACKER and A. A. GRANOVSKY (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 287–295*).—The authors report success in killing the larvae of *Ellopia fiscellaria* Guenee, attacking hemlock and balsam, with an application of calcium arsenate at the rate of 20 lbs. per acre dusted over a mixed rugged forest from an airplane.

Notes on the life-history of the four-banded leaf-roller, Eulia quadrifasciana Fern. (Lepid.), S. W. FROST (*Canad. Ent., 59 (1927), No. 7, pp. 149–152, figs. 5*).—A brief account of observations of the biology of this leaf roller made in 1922 and 1923 at the Pennsylvania Experiment Station.

A new pest of spinach in Virginia.—Preliminary report, F. W. POOS (*Virginia Truck Sta. Bul. 56 (1926), pp. 489–497, fig. 1*).—This is an account of the Hawaiian beet webworm (*Hymenia fascialis* Cram.) which attacked the fall crop of spinach in the region of Norfolk, Va., in outbreak numbers for the first time during the fall of 1926. The account is preliminary, being based upon observations made during the latter part of 1926. This webworm, apparently of subtropical origin, having been reported from practically all of the temperate and subtropical regions of both hemispheres, has done extensive damage to beets in the Virgin Islands, sugar beets in Hawaii, and has often seriously infested beets and Swiss chard in the United States. Natural enemies were of little importance in holding this pest in check in the Norfolk region during 1926. Preliminary control work with arsenical sprays and dusts gave negative results, apparently due to the habit of the young larvae of feeding on the lower surface of the leaves without eating the upper surface. Observations in 1926 showed conclusively that most of the spinach which was planted after September 1 was not damaged to any great extent, indicating that a planting later than that date in the Norfolk region would avoid damage. An account of this insect by Marsh in Hawaii has been noted (E. S. R., 28, p. 249).

The iris borer now attracts attention, E. McDANIEL (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 6–8, figs. 2*).—Notes are given on the iris borer, *Macronoctua onusta*. This lepidopteran passes the winter in the egg stage on the leaves and stalks of lilies, both wild and cultivated plants being infested.

Airplane dusting for sugarcane borer control in Louisiana, W. E. HINDS and H. SPENCER (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 352–359*).—These data are based upon the investigations previously noted (E. S. R., 57, p. 554).

Two caterpillar pests of the dadap (Erythrina lithosperma Bl.), E. DE ALWIS (*Ceylon Dept. Agr. Yearbook, 1927, pp. 54–56, pls. 2*).—This account relates to the dadap shoot borer (*Terastia meticulosalis* Guen.) and the dadap leaf folder (*Agathodes ostentalis* Hübn.).

The biology of the birch leaf skeletonizer (Bucculatrix canadensisella Chambers), R. B. FRIEND (*Connecticut State Sta. Bul. 288 (1927), pp. 395–486,*

figs. 29).—In the account here presented the results of investigations made during the years 1924, 1925, and 1926 of the morphology, life history, and habits of the birch skeletonizer are reported. The subject is dealt with under the headings of history, systematic position, laboratory methods, morphology, life history and habits, determination of number of instars, food plants, factors affecting abundance, geographical distribution, effect of temperature on development, and control. A bibliography of 3 pages is included.

There is but one generation a year of this lepidopteran in Connecticut, the adults of which emerge from the cocoons in June and July and oviposit on the leaves of birches. After an incubation period averaging 15 days, the larvae hatch out and mine in the leaf during the first 3 of the 5 instars, during the last 2 of which they feed externally on the under side of the leaf, skeletonizing it, this feeding averaging between 13 and 15 days. The total larval life is said to average from 38 to 46 days. The cocoon is spun on the underside of débris on the ground, and hibernation occurs in the pupal stage. The principal larval food plants are the gray, paper, yellow, and European white birches, while some feeding upon black birch has been observed. The hymenopterous parasites, of which 10 species have been reared, and ants and other predators are the principal factors affecting the abundance of this insect. This species ranges through southern Canada and northern United States, being particularly abundant around the Great Lakes and east to the Atlantic Ocean. The use of a lead arsenate spray about the middle of August is said to protect the trees against injury by the larvae.

Variations in the seasonal development of the walnut codling moth and its host as influenced by temperature, S. E. Flanders (*Pan-Pacific Ent., 3* (*1926*), *No. 2, pp. 93, 94*).—The author points out that a cold winter followed by a warm spring and summer creates conditions most favorable for the increase of this moth, while a mild winter followed by a cool spring and summer creates conditions most unfavorable. The walnut tree is affected in the same way, so that a large crop may show a heavy infestation and a small crop a light infestation, as occurred in 1925 and 1926.

The European corn borer, L. Haseman (*Missouri Sta. Circ. 160* (*1927*), *pp. 8, figs. 5*).—This is a practical summary of information on this pest.

The European corn borer in weeds and truck crops in Ohio, C. R. Neiswander and L. L. Huber (*Jour. Econ. Ent., 20* (*1927*), *No. 2, pp. 344–351*).—The authors present the results of experiments in which the European corn borer was reared on plants other than corn, together with an account of field records of the number of larvae found in weeds in heavily infested cornfields.

The European corn borer and ecological habitats, L. L. Huber and C. R. Neiswander (*Jour. Econ. Ent., 20* (*1927*), *No. 2, pp. 337–341, fig. 1*).—A report of investigations conducted at the Ohio Experiment Station relating to the use of vegetative types as indexes of certain atmospheric and edaphic factors that are thought to greatly influence the behavior of the corn borer. An attempt is made to show that up to the present time this pest has accumulated most rapidly and has occasioned most severe damage in certain restricted areas.

The status of the European corn borer in Canada (1926), L. S. McLaine and H. G. Crawford (*Jour. Econ. Ent., 20* (*1927*), *No. 2, pp. 341–344*).—This is a review of the situation up to the close of 1926.

The possibilities of Paris green as an Anopheles larvicide, B. S. Chalam (*Indian Jour. Med. Research, 14* (*1927*), *No. 4, pp. 867–874, pl. 1, figs. 2*).—The author concludes that Paris green opens up great possibilities in anopheline control work and deserves much more recognition in India as an Anopheles larvicide than hitherto.

Hessian fly in 1927, J. S. Houser (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, pp. 139–142, figs. 2*).—This account includes a map which shows the average percentage of straws infested with the Hessian fly based on a wheat field survey in 1927, the percentage being indicated in the 34 counties surveyed, and a map showing the Hessian fly-free seeding dates of the State. The pest was abundant in northern Ohio, the increase over the preceding year having been abnormally rapid.

New Zealand fungus gnats (Diptera, Mycetophilidae), A. L. Tonnoir and F. W. Edwards (*New Zeal. Inst. Trans. and Proc., 57 (1927), pp. 747–878, pls. 23, fig. 1*).—This is a synopsis of the fungus gnats of New Zealand. The author recognizes 267 species representing 38 genera.

Cyanogas calcium cyanide for housefly fumigation in certain types of buildings, C. O. Eddy (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 270–281, pl. 1*).—These data are based upon investigations noted from another source (E. S. R., 57, p. 262).

The present range of the Japanese beetle, Popillia japonica Newm., in America and some factors influencing its spread, H. Fox (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 383–391, figs. 2*).—The apparent total range—here termed the empiric range—consists of two sections, in one of which, the normal range, the insect is continuously distributed, while in the other, the area of discontinuity, it is known only from widely isolated points. Occupation of the normal range has resulted largely from natural spread, while its occurrence in the area of discontinuity is a result of long-distance transfer through artificial agencies. Within the normal range the main direction of spread is eastward, a result which is attributable to the combined action of prevailing winds and topographic influences. The apparent effects of these two factors in conditioning the rate of spread of the insect are discussed. Maps are included showing the normal range and approximate concentration of the beetles for the years 1925 and 1926.

A new phototropic apparatus, E. A. Richmond (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 376–382, pl. 1, figs. 2*).—The author describes an apparatus recently devised for use in connection with certain phototropic experiments on the Japanese beetle relative to the value of color and light.

The Asiatic beetle (Anomala orientalis Waterhouse), R. B. Friend (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 362–364*).—The author finds that in Connecticut this beetle usually has one generation a year, but in a small percentage of cases it takes two years to complete the life cycle, as reported by Britton and Zappe (E. S. R., 55, p. 251). Hibernation takes place, as a rule, during the third instar, the larvae pupating during June and July and the adults occurring in July and August.

Control of Japanese beetle grubs (*Penn. Dept. Agr. Bul. 440 (1927), pp. 21, figs. 9*).—In the first part of this bulletin (pp. 3–14) B. R. Leach and J. W. Lipp deal with the treatment of lawns. In part 2 (pp. 15–21) B. R. Leach and W. E. Fleming deal with the treatment of nursery stock.

Soil treatment and scouting for the control of the Asiatic beetle, J. P. Johnson (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 373–376*).—It is stated that approximately 1,400 acres were under quarantine for *Anomala orientalis* Waterh. at New Haven, Conn. Carbon disulfide emulsion was used successfully in controlling them, and during the year 100 acres were treated.

A suggestion for controlling the locust borer, Cyllene robiniae, C. C. Compton and W. P. Flint (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 295–298*).—Bands containing tanglefoot mixed with sodium fluoride and sodium arsenite have been found to kill all locust beetles coming in contact with them. This seems

Experiments in control of the rose-chafer, Macrodactylus subspinosus Fab., in vineyards, G. A. RUNNER and J. R. EYER (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 194, 195*).—This is an abstract of a report on tests of some of the newer insecticides compared with the arsenate of lead and molasses mixture. All of the arsenicals tested were toxic to the rose chafer when used in sufficient amounts. Dusts of sodium fluosilicate and hydrated lime or talc were only slowly toxic, did not protect the vines against feeding, and burned the foliage unless large quantities of the diluent were used. Pyrethrum soap emulsion was highly toxic and killed from 80 to 100 per cent of the beetles in 24 hours after spraying, but it did not prevent injury to the vines from incoming migrants. Orthotoluidine emulsion was more slowly toxic, requiring several days to kill caged adults. The other materials tested were only doubtfully effective or entirely valueless. The rose chafer was not attracted by essential oils, alcohols, or fruit juices exposed in bait pans in infested vineyards.

Mexican bean beetle in Pennsylvania, T. L. GUYTON and J. N. KNULL (*Penn. Dept. Agr. Bul. 447 (1927), pp. 9, figs. 6*).—A practical account of this pest first found in Pennsylvania in 1924, which in 1926 caused heavy damage to garden beans in parts of Greene and Washington Counties.

Wireworms of Alberta (a preliminary report), E. H. STRICKLAND (*Alberta Univ., Col. Agr. Research Bul. 2 (1927), pp. 18, fig. 1*).—In this account the author reports upon the life history of *Ludius aeripennis* Kirby, and makes recommendations for its control.

Calcium cyanide as a control for the cranberry root worm on cultivated blueberries, B. F. DRIGGERS (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 267–270*).—In experiments at the New Jersey Experiment Stations with sodium fluosilicate used against the adult cranberry root worm (*Rhabdopterus picipes* Oliv.) it failed to give satisfactory control. Experiments with both the dust and granular calcium cyanide used against the adults indicate that the insect can be controlled by use of the granular calcium cyanide.

The problem of curculio control in Connecticut apple orchards, P. GARMAN (*Jour. Econ. Ent., 20 (1927), No. 1, pp. 196–199*).—This is a report of field experiments and observations made of different phases of curculio (*Conotrachelus nenuphar*) control, especially comparisons of 7-day applications with other schedules from which this spray is omitted. A variation of about 10 per cent of clean fruit was obtained by the different treatments, which was, however, very small and of doubtful importance in many cases. Some data indicate that fish oil used as a sticker at the calyx period gave almost as good results as the complete schedule, and it appears possible to lessen the number of sprays for curculio control by this means.

Chemical Warfare Service boll weevil investigations, H. W. WALKER and J. E. MILLS (*Indus. and Engin. Chem., 19 (1927), No. 6, pp. 703–711*).—This is a progress report of work conducted by the chemical division of the Chemical Warfare Service which led to the following general summary and conclusions:

"Commercial sodium fluosilicate is more toxic to the boll weevil than commercial calcium arsenate on a volume basis, but on account of the greater apparent density of the fluosilicates it requires from 2 to 4 lbs. of them to cover effectively the same area that 1 lb. of commercial calcium arsenate will cover. These commercial fluosilicates show some injury to the cotton plant. So-called 'light' and 'extra light' commercial materials containing less sodium fluosilicate are still too dense from the standpoint of covering power, and their effectiveness is decreased with the lowering of the Na_2SiF_6 content. Also, the plant injury is decreased. When the Na_2SiF_6 content is reduced much below

"A special fluosilicate made at Edgewood Arsenal containing about 80 per cent Na_2SiF_6 and 20 per cent SiO_2 is at least as effective on a pound per pound basis as calcium arsenate, and the plant injury caused by it is of low economic importance. Barium fluosilicate made in the same way as the sodium fluosilicate, containing about 90 per cent $BaSiF_6$ and 10 per cent SiO_2, is about as effective on a pound per pound basis as calcium arsenate and causes no appreciable plant injury. The toxicity of the barium fluosilicates in general is somewhat less than that of the sodium fluosilicates. When the dust is applied to the plants 5 days before the weevils are introduced, both the sodium and barium fluosilicates cause at least as great weevil mortality as freshly dusted calcium arsenate. Calcium arsenate applied 5 days prior to the introduction of weevils in the cage causes appreciably lower mortality than freshly dusted calcium arsenate. In these tests the cages were covered to prevent rain from washing the dust off the plants.

"Specially prepared calcium arsenate containing only 24 per cent arsenic as As_2O_5, the arsenic being contained mainly in the coating of each particle, is equally as effective as commercial calcium arsenate and was nontoxic to the plant in these tests. Calcium arsenate similarly prepared, containing only 10 per cent As_2O_5, was less effective than commercial calcium arsenate. Calcium arsenate may be prepared to contain any desired percentage of arsenic as As_2O_5 by heating the requisite amount of As_2O_3 with precipitated chalk in the presence of air at a temperature of about 650° C. for one hour or less. Barium fluoride and cryolite are at best only slightly less effective than calcium arsenate on a volume for volume basis and cause no appreciable plant injury. They require an increased poundage per acre over calcium arsenate, however, and no economical means of adapting their physical properties to overcome this has yet been devised.

"While small percentages of As_2O_3 adsorbed on coal dust showed definite weevil toxicity and practically no plant injury, they were not so effective as calcium arsenate. When these percentages were increased they caused definite plant injury without raising the weevil toxicity to a point equal to that of calcium arsenate. Four per cent of arsenic trioxide on coal dust killed the plant. Arsenic trioxide is definitely more toxic to both the plant and the weevil than arsenic pentoxide. Very insoluble organic arsenicals of known high general toxicity, such as diphenylamine chloroarsine, diphenylamine arsenious oxide, diphenyl arsenious oxide, etc., were at best only slightly toxic to the boll weevil, owing probably to their low solubility.

"Preliminary tests indicate that the fluosilicates in molasses mixtures are at least as toxic to the boll weevil as calcium arsenate in molasses mixtures. It is further indicated in tumbler tests that molasses mixtures of calcium arsenate are about as toxic to the weevil as calcium arsenate dust. There are some indications that a calcium arsenate-honey mixture is superior to a calcium arsenate-molasses mixture containing the same amount of calcium arsenate. Unfavorable weather and crop conditions made it impossible to make trustworthy comparisons of the relative effectiveness of the fluosilicates, the special calcium arsenate, and commercial calcium arsenate from the 1-acre plat tests made to date. All these materials showed definite weevil control, and there was no plant injury apparent on field cotton in any case. . . . There is little hope of poisoning the boll weevil in the field by the use of volatile gases.

"The following are various estimates pertaining to the weevil: Average weight of boll weevil (does not include undersized weevils), 15 mg.; amount of air breathed by a boll weevil per hour, 0.33 cc.; minimum arsenic required

to kill a boll weevil, 0.00013 mg. (possibly too high); average arsenic content found in weevils killed with calcium arsenate, 0.002 mg.; amount of water a weevil drinks per day, 0.02 cc.

"No substances were found which definitely attracted or repelled the boll weevil. No substances were found which irritated the weevil sufficiently to make it fly."

Winter survival of the cotton boll weevil at Florence, S. C., F. A. Fenton and E. W. Dunnam (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 327–336*).—This is an account of studies conducted from 1922 to 1926, during which period an average of 3.27 per cent of weevils survived the winter in various types of protective shelters.

Disinfection of coffee seed attacked by the coffee berry beetle (Stephanoderes hampei Ferr.) [trans. title], J. G. J. A. Maas and K. B. Boedijn (*Meded. Alg. Proefsta. Alg. Ver. Rubberplanters Oostkust Sumatra, Alg. Ser., No. 29 [1926], p. 16; Eng. abs., p. 16*).—A report of a series of experiments with air and water pressure, turpentine and formalin vapors, napthalene, and camphor and formalin tablets as a means of control of the coffee berry beetle (*S. hampei* Ferr.).

On the shot-borer beetle of Chamaecyparis obtusa [trans. title], T. Yasumba (*Forest Expt. Sta. [Japan] Bul., 1 (1925), No. 1, pp. 30–34, pl. 1, fig 1; Eng. abs., pp. 33, 34*).—In studying the scolytid beetle *Phloeosinus perlatus* Chap. in *C. obtusa* at Kiso and Chiba, Japan, the author has found that it can be trapped by lures of cut trunks and piled bark placed here and there in the forest.

The genus Ips on the Stanford campus, R. W. Doane (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 284–286*).—It is stated that *I. confusus* has supplanted *I. plastographus* and *I. radiatae*, which were formerly more abundant.

Modern bee-keeping, H. Mace (*Harlow, Eng.: Modern Bee-Keeping 1927, pp. 225, pls. 16, figs. 106*).—This is a practical account on general management of bees, advanced beekeeping, diseases, and flowers, hive making, and recipes.

Apicultural questions, I, M. Kuntzsch (*Imkerfragen. Berlin: A. Stein, [1926?], 5. ed., vol. 1, pp. 240, figs. 81*).—A practical handbook, consisting chiefly of the answers to 35 principal questions on beekeeping.

The life and care of the honeybee, O. Krancher (*Leben und Zucht der Honigbiene. Magdeburg: Creutz, 1922, 2. ed., rev., pp. [4]+167, pl. 1, figs. 89*).—This is a practical handbook.

Heinrich Thie's handbook of practical beekeeping, H. Thie, rev. by W. Harney (*Heinrich Thie's Handbuch des Praktischen Wissens für Bienenzüchter. Wolfenbüttel: Heinrich Thie, 1925, 7. ed., pp. X+604, pls. 4, figs. 513*).—This is a practical handbook of information on apiculture, a new seventh edition of an earlier work on beekeeping by Dathe.

The products of the hive, their composition and use, A. Caillas (*Les Produits de la Ruche, Leur Composition et Leurs Usages Pratiques. Orléans: Author, 1927, pp. 283+[4], pls. 12, figs. 24*).—The first part of this work (pp. 11–140) deals with honey, the second part (pp. 141–227) with wax, the third part (pp. 229–252) with propolis, and an appendix (pp. 253–283) with hydromel.

The present status of the work on the parasites of Popillia japonica Newman, J. L. King, H. W. Allen, and H. C. Hallock (*Jour. Econ. Ent., 20 (1927), No. 2, pp. 365–373*).—This is a summary of parasite introduction work conducted at the Japanese Beetle Laboratory at Riverton, N. J., since January 1, 1925.

A taxonomic and ecological review of the North American chalcid-flies of the genus Callimome, L. L. Huber (*U. S. Natl. Mus. Proc. 70 (1927),*

Art. 14, pp. 114, pls. 4).—This is a contribution from the Ohio Experiment Station in which 2 genera are erected and 112 species are dealt with, 49 being described as new.

A revision of the parasitic wasps of the subfamily Braconinae occurring in America north of Mexico, C. F. W. MUESEBECK (*U. S. Natl. Mus. Proc., 69 (1927), Art. 16, pp. 73, pls. 2, fig. 1*).—In this revision the author includes a key for the separation of the Nearctic genera of Braconinae and keys for the separation of species of the following genera: Agathirsia, Crassomicrodus, and Bassus. Descriptions of 17 new species are included.

Miscellaneous descriptions of new parasitic Hymenoptera with some synonymical notes, A. B. GAHAN (*U. S. Natl. Mus. Proc., 71 (1927), Art. 4, pp. 39, pl. 1, figs. 3*).—In this account descriptions are given of 1 new species of Braconidae, 3 new genera and 17 new species of Chalcidoidea, and 1 new species of Scelionidae.

The ticks parasitic on cattle and horses in Hokkaido, Japan, K. OOURA and K. TAKADA (*Jour. Col. Agr., Hokkaido Imp. Univ., 18 (1927), No. 4, pp. 199–206, pls. 5*).—It is pointed out that piroplasmosis has been very prevalent for some years among cattle pastured in summer in parts of Hokkaido, causing great damage to the cattle industry. A study of 7,000 ticks resulted in the identification of five species, namely, *Ixodes ricinus* L. and *I. frequens* n. sp., both taken from cattle, horses, and man; *Haemaphysalis concinna* Koch and *H. jezoensis* n. sp., from cattle and horses; and *H. bispinosa* Neum., from cattle, horses, and hares.

Australasian ticks, J. W. FIELDING (*Aust. Dept. Health, Serv. Pub. (Trop. Div.) No. 9 (1926), pp. 114, figs. 38*).—This account is devoted particularly to the classification and description of the ticks known to occur in Australia. It includes a brief introductory account of the life history of ticks; a list of species, hosts, and distribution; and a bibliography of 13 pages.

Notes on cestode parasites of birds, E. LINTON (*U. S. Natl. Mus. Proc., 70 (1927), Art. 7, pp. 73, pls. 15*).—The author considers some 34 parasites of which 9 are described as new species. A new genus (Valipora) is erected.

ANIMAL PRODUCTION

The basis of permanent pastures and their management according to newer knowledge, R. SCHNEIDER (*Die Anlage von Dauerweiden und ihr Betrieb nach Neueren Erfahrungen. Breslau: W. G. Korn, 1926, 3. ed., rev. and enl., pp. 132, figs. 32*).—The author discusses the management of pastures, especially in regard to their use for the various classes of livestock.

Browsing of range live stock, V. L. CORY (*Cattleman, 14 (1927), No. 4, pp. 15–18, 19, figs. 3*).—The kind and nature of browse found on the range at the Texas Ranch Experiment Station are described. The preferences of cattle, sheep, and goats, and the time and manner of feeding on these various plants are noted. The live oak (*Quercus virginiana*) is the most important browse found in this section.

Commercial feeding stuffs in Kentucky in 1926, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and W. A. ANDERSON, JR. (*Kentucky Sta. Bul. 279 (1927), pp. 103–141*).—This bulletin contains a summary of data as to the feeds sold in Kentucky during 1926, grouped according to class. The manufacturer's name, kind of feed, and the number of samples equal to or below their guaranty are also given (E. S. R., 56, p. 261).

The metabolism of the fasting steer, F. G. BENEDICT and E. G. RITZMAN (*Carnegie Inst. Wash. Pub. 377 (1927), pp. VIII+246, [pl. 1, figs. 6]*).—This is

a complete and detailed account of experiments on the metabolism of fasting steers carried on at the New Hampshire Experiment Station in cooperation with the nutrition laboratory of the Carnegie Institution (E. S. R., 50, p. 670).

During the period from December, 1921, to May, 1925, 2 adult steers were subjected at varying intervals to 7 different fasts of from 5 to 14 days in length. Two fasts followed pasture feeding, 1 a submaintenance ration of hay, and the other 4 a maintenance ration of hay and meal. Two smaller and younger steers were fasted for 5 or 6 days following submaintenance feeding. In each experiment daily records were made of the changes in body weight, the amount of water intake, the volume of urine and the weight of the feces excreted, the insensible perspiration, the heart rate, the rectal temperature, and the muscular activity. Most observations were made when the animals were standing.

Irregularity in loss of weight during fasting was due to irregularity in intake and outgo of visible matter, especially the water intake. The losses during the first few days were influenced by the prefasting feed level, being heaviest following pasture feeding and lightest following a period of submaintenance. After the fourth day the losses became smaller and nearly similar irrespective of previous feeding. The insensible perspiration was fairly constant, especially when environment conditions were unchanged. After 24 hours' fasting there was usually a definite decrease in the invisible perspiration, followed by a still greater decrease the second day provided the temperature was unchanged. After the third or fourth day the loss was practically constant at 3 or 4 kg. per day in fasts following maintenance or pasture feeding and about 2.5 kg. in fasts following submaintenance. Upon the resumption of feeding the insensible perspiration increased.

Changes in temperature affected the water consumption during fast. On some days no water was taken, and at other times rather large quantities were consumed. Usually less water was drunk in fasts following submaintenance and pasture feeding than following maintenance feeding. During fasting fecal excretion was greatly reduced, although some feces were passed daily throughout the fast. The amount of excretion diminished daily up to about the fifth day, after which it was about 1.5 kg. per day, containing approximately 0.5 kg. of dry matter. During 14-day fasts the number and amount of each defecation decreased until about the seventh day, after which there were a large number of small defecations daily. The character of the feces changed as the fast lengthened from soft and plastic to dry and pilular. The volume of urine voided decreased as the fast progressed, seeming to be independent of environmental temperature and water intake. A maximum of 3,048 gm. was shown by 1 steer on the fifth day of fast, and amounts less than 100 gm. were sometimes passed. Chemical analyses showed that fasting changed the chemical composition of urine from one containing a relatively low percentage of urea and significantly high amounts of hippuric acid and amino acids to one in which the nitrogen distribution was low. Little or no creatine was excreted by the larger animals during fast, but the smaller animals excreted noticeable amounts. The total loss of nitrogen varied with the length of fast, being exceptionally low in fasts after submaintenance.

Steers adjusted themselves to fast more rapidly than to submaintenance. Even after 14 days' fasting, there were no signs of lack of vigor. As the fast progressed the animals spent a larger proportion of time lying down than when on feed. Rumination practically ceased after the second day, lasting somewhat longer after a dry ration than after pasture feeding.

Heart rate during fast decreased to a level of 28 to 30 beats per minute.

38.2° C. On the first day of fasting the respiratory quotient was 0.82 or 0.83, decreasing to 0.7 on the third day and remaining fairly constant. The younger steers had a higher metabolism when fasting after submaintenance, indicating a higher metabolism of the younger protoplasm.

In a 4-day respiration experiment, a higher heat production was noted with alfalfa hay than with timothy hay on a maintenance ration. Environmental temperature had no influence on metabolism when animals were receiving a maintenance ration of timothy hay or when fasting after such a ration. A difference of from 20 to 30 per cent was noticed in the metabolism in the lying and standing positions on days with feed. The level of metabolism varied with the seasons of the year and with the amount and character of the ration. Submaintenance feeding, especially with alfalfa hay, lowered the level of fasting metabolism.

The probable basal energy requirement of cattle is about 1,300 calories per square meter of body surface for 24 hours when the animal is lying the entire time and 1,700 calories when the animal is standing.

Steers took several hours to consume even 1 or 2 kg. of hay after fasting. The metabolism increased almost immediately after the animal was fed, but after this initial response there was no further stimulation of metabolism. The ingestion of 7 kg. of hay produced over a 24-hour period an increase in total heat production of 50 per cent in the case of timothy hay and 60 per cent in the case of alfalfa hay. Temperature affects the metabolism less with these larger ruminants than with other animals. Adult steers showed a persistently low metabolism when changed from maintenance to a submaintenance ration, but younger animals did not react so rapidly to a reduction in food.

Bangalore maintenance experiments.—First series, F. J. Warth (*India Dept. Agr. Mem., Chem. Ser., 9 (1926), No. 2, pp. 37–61, figs. 4*).—Comparing the net energy value of rice straw and baled hay (Bolarum Rukh hay), three pairs of mature bullocks were fed at the Bangalore Experiment Station. The live weights of the pairs were approximately 1,000, 750, and 500 lbs., respectively. The concentrate ration was identical for each pair of animals. The roughage for one of each pair consisted of rice straw and for the other hay. Digestion experiments were carried out at three stages of the feeding with the two roughages. Estimates were made of the net energy, and observations were made of the physiological effect upon the animals.

The digestion trials showed a higher digestibility for rice straw than has been found in American trials. The author believes this to be due to the better digestion of the Indian bullocks. The hay had a very low digestibility. The net energy values of rice straw and hay were 40 and 36 Therms per 100 lbs., respectively, or 44 and 39.6 Therms per 100 lbs. dry matter, respectively. The rice straw caused diuresis in the bullocks, due to the high potash content of the straw.

Tests of rations for finishing baby beef, G. A. Brown and G. A. Branaman (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 14–16*).—In continuing the comparative study of rations for baby beef (E. S. R., 55, p. 665), 3 lots of calves, 5 steers and 5 heifers per lot and averaging approximately 382 lbs. in weight, were used for comparing ground barley and shelled corn, and linseed oil meal and alfalfa hay in a 210-day test. Silage and alfalfa hay were fed to all lots. Whole oats and ground barley or shelled corn, equal parts, were fed the first 60 days; 3 parts barley or corn and 1 part oats the next 30 days; and barley or corn alone the last 120 days. Lot 1 received barley and lots 2 and 3 corn. In lot 2, 1 lb. of corn was replaced by 1 lb. of linseed oil meal the first 100 days, 1.5 lbs. the next 70 days, and 2 lbs. the last 40 days.

The average daily gain per head in the respective lots was 1.88, 2.17, and 1.9 lbs. The calves in lot 1 consumed an average of 380 lbs. of barley, 57 lbs. of oats, 546 lbs. of silage, and 243 lbs. of hay per 100 lbs. gain. Lot 2 required 294 lbs. of corn, 42 lbs. of oats, 62 lbs. of linseed oil meal, 666 lbs. of silage, and 228 lbs. of hay per 100 lbs. gain. Lot 3 ate 387 lbs. of corn, 56 lbs. of oats, 590 lbs. of silage, and 260 lbs. of hay per 100 lbs. gain. The calves in lot 1 went off feed easily and did not exhibit keen appetites. The necessary price to pay for the feed and calves was practically the same in all lots, but lot 2 had the best finish and brought the highest price on the market. The return per bushel of grain was $0.99, $1.45, and $1.20 in the respective lots.

Digestibility of teff-hay for sheep, J. C. Ross, A. M. Bosman, et al. (*Union So. Africa Dept. Agr., Sci. Bul. 57 (1927), pp. 24, pl. 1, figs. 5*).—Three digestion trials were conducted at the Transvaal University College, Pretoria, using four 3-year-old Merino wethers in each trial to determine the digestibility of teff (Eragrostis abyssinica) hay. During a transitional period of from 6 to 12 days the animals were gradually accustomed to the ration of teff hay. This was followed by a preliminary period of from 7 to 10 days, during which the animals were confined in the digestion stalls and accustomed to the harness and feces bag. The experimental period lasted 14 days, being divided into two consecutive 7-day periods for two tests, and a single 12-day period in the third test. The feces bags were emptied every morning and usually partially dried and then analyzed. Water was available for the animals at all times.

The digestible nutrients, especially the crude protein, varied considerably in the hays used. The average of the 3 trials gives the following coefficients of digestibility: Crude protein 57 per cent, ether extract 31.4, crude fiber 69.1, and nitrogen-free extract 57.2 per cent. The average chemical composition of teff hay from nine different sources is reported as dry matter 92.6 per cent, crude protein 8.1, ether extract 1.1, crude fiber 33, nitrogen-free extract 43.8, and ash 6.6 per cent.

Fattening western lambs in the cornfield: Cornfield and dry-lot feeding compared, D. S. Bell and L. E. Thatcher (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, pp. 148–151, figs. 2*).—The average of two trials is reported, in continuance of work previously noted (E. S. R., 57, p. 170). Seven lots of black-faced western lambs, averaging 60 lbs. in weight were turned into cornfields, and, with the exception of one lot, were allowed various supplements to standing corn. An eighth lot was fed shelled corn, linseed oil cake, and legume hay in dry lot. The supplementary feeds allowed in the cornfield were linseed oil cake, legume hay, cake and hay, rape, soy beans, and bluegrass. Cake and hay were fed in the lots getting rape and soy beans after these feeds were eaten.

Based on the return per acre (60 bu. shelled corn basis) the combination of 0.8 lb. of legume hay and 0.14 lb. of linseed oil cake daily proved the best. This was followed in the order named by hay, rape, dry lot, soy bean, linseed oil cake, bluegrass, and standing corn alone.

Is a lamb born or made a cull? D. S. Bell (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, p. 152*).—Nineteen cull lambs were fed to determine whether their condition was due to breeding or to treatment. They were full fed from December 13 to January 26 on a ration of 2 parts oats and 1 part bran, together with all the good legume hay they would eat. During this period they were drenched for stomach worms 4 times and dipped for ticks once. They gained 0.15 lb. per head daily during this time. After January 26 they were full fed shelled corn and alfalfa hay with 0.15 lb. of linseed oil cake per head daily. During a 98-day feeding period they made an average daily gain of 0.33 lb. Credit-

ing the lambs with the wool sheared, they returned an average of $7.11 per head, based on estimated costs. The author concludes that neglect on the part of the producer was responsible for the lambs being classed as culls.

Absence of uniformity in growth of the Merino fleece, J. E. Duerden and V. Bosman (*Pastoral Rev., 37 (1927), No 6, pp. 543, 544, figs. 2*).—Samples of wool were measured at the Rhodes University College, South Africa, to obtain information on the rate of growth of wool fibers. The diameters of a short length of a large number of fibers taken from three different levels of a staple were measured. Seven samples of wool were used, and 500 measurements were taken. The length of staple, crimp, and quality were also determined. Nothing was known of the conditions under which the sheep had been kept, so that causes for differences could not be determined.

The number of samples was sufficient to show that the fleece of the Merino sheep seldom grows uniformly throughout the year. The average diameter of the seven samples varied from 13.9 to 23.6 μ. In every case the diameter of the fibers nearest the skin was less than the diameter at the outer end of the fiber, indicating that the growth of the fleece is less vigorous at the end of the season.

Pasture for hogs, L. A. Weaver (*Missouri Sta. Circ. 158 (1927), pp. 8, fig 1*).—This is a summary of the work previously noted (E. S. R., 57, p. 270).

Hogging off corn returns good profit, W. E. J. Edwards and G. A. Brown (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 9–11*).—This work has been continued (E. S. R., 55, p. 361), using the same feeds. Nine pigs averaging 141 lbs. in weight were pastured on each lot, beginning October 7.

One acre of corn yielding 37.7 bu. with rape fed 9 pigs 29 days; 1 acre yielding 38.5 bu. with tankage fed 9 pigs 28 days; and 1 acre yielding 31.06 bu. with soy beans fed 9 pigs 27 days. The average daily gains were 1.66 lbs. with rape, 1.43 lbs. with soy beans, and 1.77 lbs. with tankage. The tankage-fed pigs returned a slightly lower value per bushel of corn consumed, but had keener appetites, gained faster, and harvested the crop more quickly than the other lots. Estimates of the feed costs showed that all lots returned a high value for the corn consumed.

Improving a corn and tankage ration for pigs in dry lot, W. L. Robison (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, pp. 156–160*.—This is a summary of work previously noted (E. S. R., 53, p. 470; 54, p. 163; 55, p. 666; 57, p. 171).

Cottonseed meal poisonous to pigs, G. Bohstedt, R. M. Bethke, and B. H. Edgington (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, pp. 153–155, fig. 1*).—Three lots of 5 pigs were self-fed for 132 days in an indoor concrete pen on rations of corn, minerals, and either linseed oil meal or cottonseed meal. In lot 1 linseed meal made up 25 per cent of the ration, and in lots 2 and 3 20.2 and 25 per cent, respectively, of cottonseed meal was fed. A 2 per cent mineral mixture composed of 40 lbs. of pulverized limestone, 40 lbs. of special steamed bone meal, and 20 lbs. of salt was fed to all lots.

The pigs in lot 1 made fair gains under the conditions in which they were kept, their protein supplement being somewhat deficient. One pig in lot 2 and 2 in lot 3 died before the end of the trial. The pigs fed cottonseed meal had a rough and wrinkled appearance for some time before death. One pig in lot 3 went into convulsions when disturbed. Post-mortem examination showed rather typical hemorrhages of the intestinal mucosa, with interlobular infiltration of the lungs associated with poisoning. Examination of the carcasses of cottonseed meal fed pigs on the morning after slaughter showed the internal fat and the outside of the hide to be extremely yellow.

Economic winter rations for farm work horses, winter 1926–27, R. S. Hudson (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 21, 22*).—Continuing

this work (E. S. R., 57, p. 662), it was found that work horses could be wintered at a feed cost as low as 8.2 cents per head per day. An average of 8 lbs. of alfalfa hay and 5.4 lbs. of shredded corn fodder was the ration used. There was a loss of 0.46 lb. per head daily on this ration, but this loss did not interfere with spring work when the animals were prepared by adding grain to the ration.

Poultry production, W. A. LIPPINCOTT (*Philadelphia: Lea & Febiger, 1927, 4. ed., rev., pp. VIII+17-602, pls. 2, figs. 205*).—This is the fourth edition, revised and enlarged, of this book, previously noted (E. S. R., 36, p. 597).

Palatability of poultry feeds, D. C. KENNARD and L. B. NETTLETON (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, pp. 161-163*).—In order to determine the effect of the coarseness or fineness and of different ingredients upon the palatability of feed, tests were conducted with one group of 100 White Leghorn pullets and another group of 80 Barred Rock pullets. Three mixtures were used, the first consisting of coarse-ground yellow corn 65, winter wheat middlings 20, medium meat scraps 10, medium granulated chick-size poultry bone meal 4, and salt 1 per cent. The second mixture was the same as above except that all ingredients were finely ground. The third mixture was composed of ground yellow corn 30, ground wheat 20, ground oats 20, wheat bran 10, winter wheat middlings 10, and medium meat scraps 10 per cent.

For each 100 lbs. of the coarse mash consumed the Leghorns ate 70.2 lbs. of the fine mash and 47.5 lbs. of the mash containing wheat and oats. The Barred Rocks ate for each 100 lbs. of the first mash 65.4 lbs. of the second and 23.8 lbs. of the third mash.

Dehydrating yolk in America, H. ROSNER (*Ice Cream Trade Jour., 23 (1927), No. 4, pp. 67, 68, figs. 2*).—This is a description of the methods employed in dehydrating egg yolks.

DAIRY FARMING—DAIRYING

Feeding dairy cattle, C. B. BENDER (*New Jersey Stas. Bul. 438 (1927), pp. 24, figs. 6*).—A bulletin of popular nature divided into three parts. Part 1 deals with feeding for milk production, part 2 with breeding and feeding young stock, and part 3 with feeding for records. Appended are tables giving the percentage of crude protein and total digestible nutrients in some of the more common feeding stuffs and the comparative costs of several feeds.

Barley compared to corn in dairy rations, J. E. BURNETT and O. E. REED (*Michigan Sta. Quart. Bul., 10 (1927), No. 1, pp. 3-5*).—Two lots of 5 cows each were fed by the reversal method to compare corn and barley for milk production. Each period was 30 days long, the first 10 days of which were considered preliminary. The grain ration consisted of ground corn and ground barley, ground oats, bran, and linseed oil meal, 4 : 3 : 2 : 1, fed according to milk production. Alfalfa hay and corn silage were fed at the rate of 1 and 3 lbs., respectively, for each 100 lbs. of live weight.

The results show that the lot started on corn produced more milk and butterfat on that ration, and that the lot started on barley produced more milk and butterfat on that ration. It was concluded that the two grains are of equal value for feeding dairy cattle.

Feeding sugar beet to dairy cows (*Livestock Jour. [London], 105 (1927), No. 2769, p. 439*).—Sugar beets (roots only) and mixed maize and sunflower silage were compared at the Potchefstroom School of Agriculture, Union of South Africa, to determine their value as feed for dairy cows. Two groups of cows were fed by the reversal method on each feed. It was found that 30 lbs.

of sugar beets could replace 25 lbs. of silage satisfactorily. A 4-gal. cow could consume up to 40 lbs. of beets and a 3-gal. cow up to 36 lbs. of beets without any ill effects. No appreciable difference in the composition of the milk was found when the cows were changed from one feed to the other.

Antiscorbutic vitamin content of milk of stall-fed cows throughout a year, F. L. MacLeod (*Jour. Amer. Med. Assoc., 88 (1927), No. 25, pp. 1947–1949*).—Guinea pigs on a diet adequate in all respects but devoid of vitamin C were fed varying amounts of milk from cows receiving a ration of mixed grains, alfalfa hay, corn silage, and beet pulp. This is considered an optimum ration for cows. The cows were allowed exercise in a yard, but had no access to pasture throughout the year. The guinea pigs used were grown normally and weighed from 300 to 350 gm. when placed on experiment. The milk was fed 6 days a week. It was given by a medicine dropper in 2 or 3 feedings per day. The various lots were fed 30, 40, and 50 cc. of milk and were compared with a check lot receiving no milk. The pigs were continued on experiment 90 days, and the degree of scurvy was determined by autopsy at this time, using the scurvy score suggested by Sherman et al. (E. S. R., 46, p. 865). Another bunch of pigs were then placed on experiment, so that the whole test lasted one year.

Among the animals fed 30 cc. of milk, none died from scurvy before the end of 90 days. The average scurvy score with these animals was 9. Most of the animals lost weight from the time scurvy set in at from 70 to 80 days. The average scurvy score for the animals fed 40 cc. of milk was 3. Most of these animals showed no outward signs of scurvy, but the symptoms were easily seen at autopsy. Many of the animals had diseased lungs. There was some difficulty experienced in getting most of the pigs to consume 50 cc. of milk. Two animals were healthy and showed no signs of scurvy. All but 1 of the remaining pigs had diseased lungs, and 1 of these showed signs of scurvy.

The author concludes that 50 cc. of the milk used was sufficient to prevent scurvy in 300-gm. guinea pigs. Including good quality silage in the ration of stall-fed cows prevents a seasonal variation in the antiscorbutic value of milk.

Handbook of milk (Supplement), P. Sommerfeld (*Handbuch der Milchkunde (Ergänzungs-Heft). Munich: J. F. Bergmann, 1926, pp. 37, figs. 4*).—This is a supplementary edition of the book previously noted (E. S. R., 21, p. 674).

Gentian violet lactose pepton bile for the detection of B. coli in milk, M. A. Kessler and J. C. Swenarton (*Jour. Bact., 14 (1927), No. 1, pp. 47–53*).—Plain lactose broth, gentian violet lactose broth, and gentian violet lactose peptone bile were compared as to their ability to detect *Bacillus coli* in milk. In all but 10 of 1,010 determinations the gentian violet lactose peptone bile showed typical growth for members of the *B. coli* group. This latter media proved more reliable for the detecting of this group of bacteria than either of the other media. Further tests indicated that a 1 per cent concentration of bile in this media was practical for routine analyses, and also that the cost of material was less than one-fourth of that of the 5 per cent media.

Does the souring of cream increase the test? O. F. Hunziker, W. A. Cordes, and B. H. Nissen (*N. Y. Prod. Rev. and Amer. Creamery, 64 (1927), No. 8, pp. 312, 314, 316, 318, 319, fig. 1*).—Experiments were undertaken to determine the effect of holding cream under conditions suitable for souring upon the fat test of the cream. Weighed quantities of cream were held for periods of 3 weeks under various conditions of storage and temperature. Part of the cans were stored at 40° F. and others at room temperature. Some cans were sealed, others were sealed but opened daily and stirred, and others had the lids

tilted and were also stirred daily. Other samples were held in tubes and in Babcock test bottles.

Tests of cream held in sealed cans did not change their fat test in a 3-week period, even when the acidity reached 2.4 per cent. This was true of cans held in a cooler and at room temperatures and also of the samples in the Babcock test bottles. When the cans were held at room temperatures with the lids tilted there was an increase in test of from 1 per cent after the first week to 4.75 per cent after the third week. This increase in test was accompanied by a decrease in the weight of can, amounting to a loss of 1.875 lbs. in 3 weeks from a 20-lb. sample. Tests showed that while the fat test increased with these latter samples there was no increase in the total amount of fat present, the increase being entirely due to the loss of moisture by evaporation. The practice of souring cream on the farm to increase the fat test depreciates the quality of the product and diminishes rather than increases the return to the producer.

The development of metallic flavor in buttermilk, M. P. BAKER and B. W. HAMMER (*Iowa Acad. Sci. Proc., 32 (1925), pp. 55–58*).—This is a discussion of some work at the Iowa Experiment Station in an effort to determine the relationship of bacteria to the development of metallic flavor in buttermilk. Samples were placed in glass pint bottles, and some of these were left at room temperature and others put in a cooler at 12° C. (53.6° F.). The samples in the cooler developed metallic flavors in from three to seven days, while those at room temperature seldom became metallic. This fact was probably due to other bacteria outgrowing those producing the metallic flavor when grown at room temperature. Sterile samples of buttermilk were inoculated with the starter organisms (*Streptococcus lactis*, *S. citrovorus*, and *S. paracitrovorus*), either one organism at a time or a combination, and handled as with the unsterile samples. In this case the samples held at room temperature developed metallic flavors more frequently than those held at 12°.

Metallic flavor can be produced in buttermilk held in glass containers. The metallic flavor is developed only when *S. lactis* is in combination with one or both of the other starter organisms. Adding small amounts of lactic acid to the sample and then inoculating had no effect upon the development of this flavor. The metallic flavor develops more readily in buttermilk than in any other dairy product.

Meeting the demand for cottage cheese, B. SPENCE (*Milk Dealer, 16 (1927), No. 9, pp. 46, 48*).—The author gives clear, concise directions for the manufacture of sweet or rennet curd cottage cheese.

Black spot in cheese, R. H. LEITCH (*Scot. Jour. Agr., 10 (1927), No. 2, pp. 165–171, pls. 4*).—The dairy research department of the West of Scotland Agricultural College reports the results of a study of the cause of black spot in cheese. A bacterial analysis failed to give positive results, and such organisms as were isolated from the spots did not produce spots in the resultant cheese.

Various minerals were tried, such as sulfur, zinc, and copper, with negative results; but when lead was used positive and striking results were secured. Commercial red lead, chemically pure red lead, white lead, white paint with a lead base, lead acetate, solder, and incrustations from the interior of lead pipes were added in small amounts to the cheese milk at and before renneting, and in every case black spots occurred in the resultant cheese, either in large or small amounts. The sources of contamination in practice is in most cases the cheese vat itself, the outer casing of which is usually painted with red lead for protection. Small particles of paint which fall into the vat and the

The rôle of gelatin in ice cream, G. D. Turnbow and F. W. Milner (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 202–209*).—Determinations of the effect of the quality and concentration of gelatins on the viscosity of ice cream mixtures as determined by the MacMichael viscosimeter; of pH on the clarity of gelatin solutions; and of the original pH of the gelatin on the pH of the ice cream mix, are reported.

It is noted that an ice cream mix possesses viscosity of two types, the one, defined in this paper as the "real" viscosity, being found in varying degree in all solutions either of crystalloids or of colloids while the other, here described as "apparent" viscosity, is dependent upon the degree of swelling of the colloid micellae. In mixtures having 11 per cent fat, 36.84 per cent total solids, and 0.5 per cent gelatin the viscosity varied with quality among 4 gelatins, rated from poor to excellent, between 9.36 poises after 48 hours and 28.60 poises after but 24 hours standing, with a "set" condition after 48 hours standing such that no determination of viscosity could be made. The viscosity in centipoises after 24 hours standing of a mixture containing a good gelatin increased with the concentration, but in far more than linear proportion to it, the values of 64.6 at 0.2 per cent gelatin, 428 at 0.4 per cent, and 2,892 at 0.6 per cent being among the figures reported. Any given gelatin showed greatest gel strength and turbidity at or near its isoelectric point, at about pH 4.7. The initial pH of the gelatin had no practical effect upon that of the mixture in 20 determinations of the pH of ice cream mixtures made up with gelatins ranging in their initial pH from 3.0 to 8.0.

VETERINARY MEDICINE

Diseases of equines and bovines, S. Miranda (*Enfermedades de los Solípedos y de los Bóvidos. Cuenca, Spain: Ruiz de Lara, 1926, pp. 408*).—The several parts of this work deal with diseases of the organs of circulation (pp. 1–38), respiration (pp. 39–110), digestion (pp. 113–280), excretion (pp. 281–290), the blood and nutrition (pp. 291–329), joints and muscles (pp. 330–338), auto-intoxication (pp. 339–342), glands of internal secretion (pp. 343–346), avitaminosis (pp. 347–349), and the nervous system (pp. 350–402).

Contagious diseases of animals, S. Lockett (*Jamaica Dept. Agr. Ann. Rpt. 1926, pp. 10–14*).—This account deals with infectious diseases of livestock, especially foot-and-mouth disease, which has appeared from time to time since the outbreak in 1922–23. All of three recurrent outbreaks up to the close of the year had their origin on the swamp lands of the lower Cabaritta River in middle Westmoreland.

Handbook on milk, H. Rievel (*Handbuch der Milchkunde. Hanover: M. & H. Schaper, 1926, 3. ed., rev., pp. XI+432, figs. 39*).—This is a revised edition of the work previously noted (E. S. R., 26, p. 779), which has been prepared particularly for the use of veterinarians.

A standard method of recording the hemoglobin content of blood, C. A. Elvehjem and J. Waddell (*Jour. Lab. and Clin. Med., 12 (1927), No. 9, pp. 889–891*).—In this contribution from the Wisconsin Experiment Station the authors suggest that all hemoglobin determinations should be reported in grams per 100 cc. of blood in order that the results from all laboratories may be readily compared.

Studies on the toxicity of tetrachlorethylene, a new anthelmintic, A. S. Schlingman and O. M. Gruhzit (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 2, pp. 189–209, figs. 21*).—In this contribution the authors report upon tests made of the effect of tetrachlorethylene on chickens, cats, foxes, cattle, horses,

sheep, and puppies. They conclude that this chemical, like carbon tetrachloride, is more hepatotoxic than nephrotoxic, the changes being more diffusely spread and not essentially confined to the central portion of the liver lobule as in the case of carbon tetrachloride. Of the various animals treated, chickens probably tolerated tetrachlorethylene best, followed in order by puppies, cats, foxes, sheep, cattle, and horses. The changes found in the livers of these animals did not always seem comparable to the dose of tetrachlorethylene administered.

Further evidence of the safety of tetrachlorethylene for animals of various species was shown by the relatively slight amount of destruction seen in the livers of these animals. The kidneys and spleens of the animals used showed little or no effects from the action of tetrachlorethylene, except possibly in extremely large doses.

Annual report[s] of the Bengal Veterinary College and Civil Veterinary Department, Bengal, for the year[s] 1924–25 [and] 1925–26, A. D. MacGregor and P. J. Kerr (*Bengal. Vet. Col. and Civ. Vet. Dept. Ann. Rpt. 1924–25, pp. [3]+6+III+[2]+10+XIX+3; 1925–26, pp. [4]+6+III+9+XXI+2*).—These are the usual annual reports (E. S. R., 54, p. 475).

[Annual administration reports of the Civil Veterinary Department, Madras Presidency, for the years 1924–25 and 1925–26], D. A. D. Aitchison et al. (*Madras Civ. Vet. Dept. Ann. Rpts. 1924–25, pp. 23; 1925–26, pp. 1–69, pls. 5*).—These are the usual annual reports (E. S. R., 52, p. 881), in which the occurrence of and control work with infectious diseases of livestock is included.

Annual report on the Punjab Veterinary College, Civil Veterinary Department, Punjab, and the Government Cattle Farm, Hissar, for the year 1924–25, C. A. Barron, D. Milne, G. K. Walker, T. F. Quirke, and R. Branford (*Punjab Vet. Col., Civ. Vet. Dept. [etc.] Ann. Rpt. 1924–25, pp. IV+5+67+XXXVIII, pls. 10*).—This is the usual annual report (E. S. R., 54, p. 674).

Splenectomy in domesticated animals and its sequelae, with special reference to anaplasmosis in sheep, G. de Kock and J. Quinlan (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 1 (1926), pp. 367–480, pls. 42*).—In the first part of this account the authors give a description of the operation of splenectomy; in the second part they consider the "sequelae" following splenectomy of animals, "carriers" of piroplasms or anaplasms.

The operation of splenectomy in susceptible equines, bovines, goats, and ovines was carried out with practically no impairment, a transitory polyglobuly and neutrophilia being seen in some of the cases.

Black-quarter in South Africa: With special reference to improved methods of protective inoculation, P. R. Viljoen and J. R. Scheuber (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 1 (1926), pp. 499–570, fig 1*).—In this discussion the authors deal with the control of blackleg by immunization and the variation in blackleg strains as regards pathogenic properties and immunizing power. A list of 80 references to literature is included.

Confirmatory evidence that Habronema larvae are not the etiological factor in bursattee, S. B. Freeborn, G. H. Hart, and C. E. Howell (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 1, pp. 52–57*).—The authors point out that at the University of California stud at Davis bursattee occurs every summer in the entire absence of *Habronema* sp., which has generally been supposed to be the inciting cause. They conclude that unless two or more types of bursattee occur, one being parasitic and another, similar to the cases in question,

of a nonparasitic origin, the nematodes demonstrated in bursattee lesions are accidental and of little etiological significance.

Experiments on foot-and-mouth disease, S. STOCKMAN and F. C. MINETT (*Jour. Compar. Path. and Ther.*, *39* (*1926*), *No. 3*, *pp. 231–245*).—This relates to work conducted at the Pirbright Experiment Station from May, 1925, and deals with the findings of the Foot-and-Mouth Disease Research Committee as published in their second progress report (E. S. R., 57, p. 77). The subject is dealt with under the headings (1) differentiation of A and O types, (2) clinical course of the experimental disease in the large animals, and (3) observations on infection by contact.

Check-list of the Muscidae and Oestridae which cause myiasis in man and animals in South Africa, G. A. H. BEDFORD (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research*, *11–12*, *pt. 1* (*1926*), *pp. 481–491*).—Twelve muscids and 26 oestrids are noted.

Serological investigations into some diseases of domesticated animals in South Africa caused by trypanosomes, E. M. ROBINSON (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research*, *11–12*, *pt. 1* (*1926*), *pp. 1–25*).—The author finds that the complement fixation test may be used for the diagnosis of dourine occurring naturally in South Africa, provided *Trypanosoma equiperdum* antigen is employed. Animals infected with *T. brucei* react to the complement fixation test when *T. equiperdum* antigen is used, but animals suffering from a pure *T. congolense* infection usually do not, though in rare cases a partial reaction may be obtained. There is some evidence to show that sera obtained from animals with pure *T. congolense* infections may give marked reactions with *T. congolense* antigen; the sera of animals infected with *T. equiperdum* react slightly or not at all to this antigen. The sera of a number of cattle showing pure infections with *T. vivax* did not give reactions to the complement fixation test when *T. equiperdum* antigen was used.

A brief discussion of the Sachs-Georgi test and a table showing the results obtained therewith, also an account of the Meinicke lipoid fixation reaction with a tabulation of the results, are appended.

A preliminary list of the known poisonous plants found in South Africa, E. P. PHILLIPS (*So. Africa [Dept. Agr.] Bot. Survey Mem. 9* (*1926*), *pp. 30*, *pls.* [*17*]).—This list of South African plants which have been proved to be poisonous includes 55 species in 40 genera of 18 families.

Stock poisoning by plants in the nightshade family, A. A. HANSEN (*Jour. Amer. Vet. Med. Assoc.*, *71* (*1927*), *No. 2*, *pp. 221–227*, *figs. 4*).—The results of chemical analyses and experimental work conducted at the Indiana Experiment Station have shown that a number of members of the nightshade family, Solanaceae, may develop poisonous properties. This paper reports upon the results of field work involving stock losses under circumstances that indicated toxic solanaceous species to have been responsible.

Experimental bracken poisoning of cattle, W. A. HAGAN and A. ZEISSIG (*Cornell Vet.*, *17* (*1927*), *No. 2*, *pp. 194–208*, *fig. 1*).—In the course of the author's investigations the so-called "undiagnosed disease" of cattle in New York State has been reproduced in all its essential features by feeding *Pteridium latiusculum*, the common brake fern, and is probably caused by that plant.

The therapeutic value of proflavine and acriflavine in the carrier state in Bang's abortion disease of cattle, I. F. HUDDLESON (*Jour. Amer. Vet. Med. Assoc.*, *71* (*1927*), *No. 2*, *pp. 231–234*).—The results obtained in two experiments conducted at the Michigan Experiment Station are considered to have demonstrated that in neither case was the *Brucella abortus* flora of the udder reduced in the slightest degree as a result of successive intravenous injections of 200 cc. of a 1:200 solution of either proflavine or acriflavine.

A study of milk from cows showing no agglutinins for Brucella abortus in their blood serum, C. M. Carpenter and C. J. Parshall (*Cornell Vet., 17 (1927), No. 2, pp. 234, 235*).—In the study here reported *B. abortus* infection was not found in the sediment or cream from any of the milk samples collected from a group of 18 cows that were negative to the blood test and had a normal breeding record, although they had been associating with a group of infected cows for 2 or 3 years. An *abortus*-like organism was recovered from one guinea pig injected with the cream from one cow. This organism was not agglutinated by an antiabortus serum.

The authors conclude that when a cow has no history of abortion or retained placenta, and her blood serum, when diluted 1:60, shows no agglutinins for *B. abortus*, she does not harbor the infection in her udder.

A study of Brucella abortus infection in milk from fifty herds supplying the city of Ithaca, New York, C. M. Carpenter and D. W. Baker (*Cornell Vet., 17 (1927), No. 2, pp. 236–247*).—*B. abortus* was found present in the milk from 9 of the 50 herds. The strains of *B. abortus* which were present in the milk from 2 of the herds supplying milk to cases of undulant fever were markedly virulent for guinea pigs. The macroscopic lesions that were produced by the infection present in this milk were similar to the lesions produced by certain porcine and human strains of *B. abortus*. The infection observed in the other 7 herds produced lesions in guinea pigs typical of the majority of bovine strains. The authors found that cream is more satisfactory for examination for *B. abortus* infection than milk sediment.

Studies of paratubercular enteritis [Johne's disease] of bovines [trans. title], H. Vallée and P. Rinjard (*Rev. Gén. Méd. Vét., 35 (1926), No. 409, pp. 1–9; abs. in Jour. Compar. Path. and Ther., 39 (1926), No. 4, pp. 331–334*).—In the investigations conducted, the best paratuberculin was obtained by cold extraction of the active substance from the microbe and the culture medium with distilled water. In the application of the intradermic and the double ophthalmic tests all the animals carrying a subcutaneous local lesion gave reactions resembling the reactions of tuberculous animals to tuberculin. The reactions obtained from paratuberculin, however, were less intense than those that are frequently obtained from the tuberculin test. It is pointed out that the occurrence of diarrhea in cases of Johne's disease should be regarded as the last symptom of an old infection. The vaccination experiments under way are considered to have given encouraging results.

The physiology of milk fever, I, P. A. Fish (*Cornell Vet., 17 (1927), No. 2, pp. 99–120, figs. 6*).—The author concludes that a variation in the sugar content of the blood, either above or below normal, has not been satisfactorily demonstrated as the causative factor; it is more likely a secondary factor resulting from an interference with the processes of oxidation in the tissues. The factor responsible for the changed tissue conditions is still to be determined.

A list of 36 references to the literature is included.

The blood sugar of the cow in milk fever, C. E. Hayden (*Cornell Vet., 17 (1927), No. 2, pp. 121–131*).—The author reports upon control in the 13 cases studied, which have failed to demonstrate a hypoglycemia in milk fever. The demonstration is more complete because the blood sugar has been analyzed to determine the relative quantities of lactose and glucose in the total sugar. With one exception, there was not an appreciable quantity of lactose in the sample taken before inflation. The pre-inflation glucose average of 83.09 mg. in six cases is a hyperglycemia when compared with the blood sugar standard of 60 mg. set for the milch cow by E. M. P. Widmark and O. Carlens[6] and L. Auger.[7]

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[6] Biochem. Ztschr., 156 (1925), No. 5–6, pp. 454–459.

[7] Rev. Gén. Méd. Vét., 35 (1926), No. 415, pp. 353–364.

Lamsiekte (parabotulism) in cattle in South Africa, A. Theiler et al. (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 2 (1927), pp. 819–1361, pls. 9, figs. 13*).—This is a detailed report of investigations based upon experimental work with lamziekte conducted largely from the years 1917 to 1921, inclusive. A popular account of some of the main features of this work has been noted from another source (E. S. R., 42, p. 477). The cause of the disease and experiments upon its production in the lamziekte area (pp. 851–1051), experiments outside the recognized lamziekte area (pp. 1051–1099), the lamziekte toxin and experiments on immunity (pp. 1090–1201), isolation and description of the toxicogenic saprophyte (pp. 1201–1211), osteophagia and phosphorus deficiency in relation to lamziekte (pp. 1211–1248, 1307–1361), symptomatology of lamziekte (pp. 1248–1292), and pathology and pathogenesis of lamziekte (pp. 1292–1306) are dealt with.

Observations on the larvae of Onchocerca gibsoni (Cleland and Johnston) in the skin of infected cattle, G. M. Heydon (*Aust. Jour. Expt. Biol. and Med. Sci., 4 (1927), No 2, pp. 61–68, pl. 1*).—The author considers the distribution of larvae throughout the skin of cattle infested with *O. gibsoni* and its similarity to the condition found in *O. volvulus*.

Infectious necrotic hepatitis of sheep in Victoria, a braxy-like sheep disease, H. E. Albiston (*Aust. Jour. Expt. Biol. and Med. Sci., 4 (1927), No. 2, pp. 113–123*).—This is an account of a disease of sheep occurring in Victoria which is similar to black disease as described by Dodd (E. S. R., 45, p. 685), and distinct from the braxy disease of Scotland. The main and primary lesion is an hepatic necrosis, due to infection with an anaerobic bacillus which resembles *B. oedematiens* (Weinberg) in a number of its characteristics. Aggressin and culture filtrate have no immunizing power.

The life-histories of Trichostrongylus instabilis and T. rugatus of sheep in South Africa, H. O. Mönnig (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 1 (1926), pp. 229–251, figs. 11*).—The author finds that the development of these two nematodes is in general the same as that of other strongyles, having a free-living larval stage divided into three periods by two ecdyses and having a parasitic stage in which also two ecdyses take place before the worms become adults.

Carbon tetrachloride in the treatment of distomiasis in sheep (*Vet. Rec., 7 (1927), No. 31, p. 679*).—A 1-cc. dose of carbon tetrachloride in gelatin capsule administered without previous starvation is said to be sufficient to clear adult flukes from the bile ducts of sheep.

The outbreak of foot and mouth disease among deer in the Stanislaus National Forest, C. Keane (*Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 4, pp. 213–226, figs. 8*).—This is an account of the occurrence of and control work with foot-and-mouth disease in deer during the outbreak among domestic animals in California in 1924, reports of which by the author (E. S. R., 55, p. 874) and by Mohler (E. S. R., 56, p. 378) have been noted. The eradication work is considered at some length. Some 43 camps were established, and as many as 250 hunters were engaged in the work at one time. The details of the eradication work, reported in tabular form, show 22,214 deer to have been slaughtered, of which 2,279 had been or were affected with foot-and-mouth disease at the time they were killed. This is said to represent a relatively small proportion of the deer which inhabit the Sierra Nevada Mountains.

The fumigation of zebras and camels with sulfur dioxide [trans. title], Rau (*Ztschr. Veterinärk., 38 (1926), No. 8, pp. 247–249, pl. 1*).—A brief account is given of the successful fumigation of the zebra and the camel with sulfur dioxide, at the Nuremberg Zoological Gardens, for the control of scabies.

Hog cholera vaccination breaks and their prevention, J. W. BENNER (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 1, pp. 58–70*).—The author concludes that the simultaneous method of vaccination, when administered properly with potent serum and virus, produces an immunity to hog cholera as nearly absolute as any known.

Parasitic nodules resembling tuberculosis in the lungs of swine, L. E. DAY, J. S. BENGSTON, and H. B. RAFFENSPERGER (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 1, pp. 39–51, figs. 4*).—The authors point out that parasitic infestation of the lungs of swine by lungworms causes nodules which very closely resemble the nodules caused by tuberculosis. The bronchi of the posterior parts of the lungs being more frequently infested with lungworms than the anterior portions, the parasitic nodules are also more frequently found in the posterior lobes, as was shown by the examination of 11,429 lungs of swine.

Metastrongylus elongatus occurred in the lungs of swine in relation to *Choerostrongylus pudendotectus* in the ratio of 31:7. *C. pudendotectus*, when present, was always associated with *M. elongatus*, but *M. salmi* was not observed. Of the 23 lungs showing parasitic nodules containing degenerated parasites, 5 showed both species present and 18 showed only *M. elongatus* present in the bronchioles. Of the 46 lungs showing nodules without parasites, 38 contained *M. elongatus* alone and in 8 both species were observed. Of the 55 lungs free of nodules, 41 contained *M. elongatus* alone and in 14 specimens both species were found. These findings indicate that *M. elongatus* produces the nodules here described, although the possibility that *C. pudendotectus* may produce nodules as well is not excluded.

Studies on abortion in mares (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 1, pp. 25–34*).—The studies here reported, presented at the annual meeting of the American Veterinary Medical Association in Lexington, Ky., in August, 1926, are given in two parts.

I. *The diagnosis and differential diagnosis of contagious abortion*, W. W. Dimock and E. S. Good (pp. 25–30).—In this paper the authors briefly consider abortion due to *Bacillus abortivo-equinus*, to *Streptococcus genitalium*, to other organisms, injuries, nutritional disturbances, and other nonspecific causes. This is followed by a brief discussion of the pathology of abortion.

II. *The results of vaccination against contagious abortion in mares*, E. S. Good and W. W. Dimock (pp. 31–34).—The authors report that they have determined by blood tests, using the agglutination test as an indicator, that a high titer of antibodies can be built up by the use of a bacterin and a much higher one by the use of a bacterin first, followed by the injection of the living organism, the method they use in producing a hyperimmune serum. The use of the bacterin has been so efficient in immunizing mares against infectious abortion due to *B. abortivo-equinus* that they soon employed this method exclusively in field work.

Commencing the use of the bacterin on 22 mares in 1 herd in 1916, the number increased annually until in 1925 it was used on 1,455 mares in 40 herds. As a result there have been but few cases of abortion among the mares vaccinated, all of which have been studied in the laboratory, and in only one instance was *B. abortivo-equinus* isolated from the fetus or the placenta. They have been able to stop abortion in all the herds that they have worked with after a sufficient amount of time had elapsed to complete the immunizing process. It is recommended that mares be vaccinated regularly in the early fall, giving three injections one week apart. The method of preparing the vaccine is described.

Necrobacillosis in equines: Clinical, pathological, and aetiological studies on an outbreak, J. B. QUINLAN, W. STECK, and E. M. ROBINSON (*Union

So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 1 (1926), pp. 571–616, pls. 3).—The authors isolated an organism closely resembling *Bacillus necrophorus* from foci in the lungs of horses dying from necrotic pneumonia. While morphologically it was identical with *B. necrophorus*, it appeared to be more difficult to cultivate. It is considered probable that the organism belonged to the *B. necrophorus* group but that it was a variation from that species, which causes such well-known conditions as disseminated necrosis of the liver in cattle and foot rot in sheep.

Parabotulism of equines [trans. title], A. Theiler and E. M. Robinson (*Rev. Gén. Méd. Vét., 36 (1927), No. 424, pp. 193–199*).—Under the name *Clostridium parabotulinum equi* the authors describe an organism that is the cause of a disease to which they give the name "parabotulism of equines." This organism was isolated from the cadaver of a rat found in a stable with mules affected with a locomotor paralysis. This organism when cultivated in pure culture produces a toxin that upon injection into the horse or administered by mouth causes the disease.

Physical, chemical, and biological studies on the virus of vesicular stomatitis of horses: Comparison with the virus of foot-and-mouth disease, P. K. Olitsky (*Jour. Expt. Med., 45 (1927), No. 6, pp. 969–981*).—In this further contribution (E. S. R., 57, p. 670), the author reports upon a taxonomic study of the virus of vesicular stomatitis and gives additional evidence to show the similarity of this virus to that of foot-and-mouth disease. It is concluded that their relationship is close, but that the differences between these two viruses and the herpetic are sufficiently marked to indicate a lack of generic connection among the three. Recent studies of this virus by Cotton have been noted (E. S. R., 57, p. 181).

Coyote susceptible to salmon poisoning, C. R. Donham and B. T. Simms (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 2, pp. 215–217*).—In studies at the Oregon Experiment Station the authors have found that the coyote, as well as the dog and the blue and silver black fox, is susceptible to salmon poisoning, developing lesions typical of those found in dogs suffering from the affection, as previously noted (E. S. R., 55, p. 176).

Bacillary white diarrhoea: Results of testing a breeding flock, T. Dalling, J. H. Mason, and W. S. Gordon (*Vet. Rec., 7 (1927), No. 33, p. 701*).—The authors report upon observations of the occurrence of this disease in birds on farms A and B, all of which fowls originated on farm B. Some 7,805 chicks were hatched out on farm A from 9 lots of eggs from farm B, the total hatch being apparently about 65 per cent, and of these about 40 per cent died of bacillary white diarrhea. Intradermal and agglutination tests were made of the 645 hens on farm B that produced the eggs hatched on farm A. Of these hens, 82 reacted to both tests, 9 reacted to the agglutination test alone, 152 to the intradermal test alone, and 402 did not react at all. Eighty eggs laid by hens that had reacted to the intradermal but not to the agglutination test were incubated, but no bacillary white diarrhea was detected. Forty chicks were hatched from 74 eggs laid by 12 hens that reacted to both tests and had been mated with a nonagglutinating cockerel, and of these chicks 10 succumbed to bacillary white diarrhea. One of the 12 hens died, the ovary showing typical lesions, and *Bacterium pullorum* was cultivated therefrom.

The authors regard complete agglutination at a serum titer of 1 to 40 as a positive reaction. They consider it probable that the intradermal test may be useful, the results of testing with the flock recorded indicating that it condemns a greater percentage of hens than the agglutination method. The authors were not able to carry out post-mortem examinations on the hens reacting to the intradermal test only.

Control of bacillary white diarrhoea, 1926–1927, H. Van Roekel (*Massachusetts Sta. Control Ser. Bul. 39 (1927), pp. 8*).—This is a report of control work conducted during the year 1926–27, during which period a total of 127,327 birds were tested, an increase of 59,408 over the preceding year. These birds represented 249 flocks, or 48 flocks more than during the preceding year. Of these, 105 flocks were tested for the first time as compared with 98 tested for the first time in 1925–26. The data on the distribution of birds tested and infection found, arranged by county and breed; the number of flocks having certain limits of infection from 1 to 60 per cent, arranged by years commencing with 1920–21; and the number of birds tested each year with the percentage belonging to each breed, as well as a comparison of flocks tested for the first time and those that have been tested previously, are given in tabular form. The reactors detected represent 4.03 per cent of the fowls tested.

The fact that in the past few years poultrymen have been using more pullets than adult hens for breeders has made necessary a revision of the testing plans for control. Pullet testing is influenced by the time the bird commences to lay, since there is a correlation between ovarian function and the appearance of agglutinins in the blood. Under the new plans three consecutive negative tests are required, so that no infected birds will remain in the flock undetected. Two plans are presented, either of which may be followed by the poultryman. In both plans the first or original test is considered the time when the flock is first found free from reactors. By the first plan, for use with birds one year of age or older or for laying pullets, the second test on such nonreactors is made 6 to 12 months later. If no reactors are found in the flock their progeny are tested, and if no reactors are detected the flock will be considered free from infection. By the second plan, for use with pullets or when more rapid clearing of the flock is desired, nonreactors are given the second test 6 weeks later. If no reactors are found their offspring are tested as pullets and if free from infection are retested 6 weeks later, and if no reactors are found the flock is considered free from infection. It is pointed out that the second plan is feasible only in the case of early hatched, early maturing flocks.

The relation of the virus of contagious epithelioma of fowls to the virus of variola and that of vaccinia.—I, Evolution of a strain of vaccinia virus from the virus of contagious epithelioma of fowls, C. G. Pandit (*Indian Jour. Med. Research, 14 (1927), No. 4, pp. 885–894, pls. 2*).—The author reports experiments which show that the virus of contagious epithelioma of fowls, when passed in succession on calves and monkeys, can be cultivated ultimately into vaccinia virus. With calf passages alone such development was not effected, the interposition of a monkey being necessary. The monkeys (*Macacus sinicus*) were not always susceptible to direct inoculation of the virus, only one out of four attempts yielding a successful vesiculation. This was not, however, typical of vaccinia virus, and the monkey was successfully vaccinated with calf-lymph 15 days later. The virus reacted negatively on both the skin and cornea of rabbits, but when they were vaccinated with passage material obtained from different stages of development the reaction first appeared only on the cornea. Only at a later stage of development toward vaccinia virus did the material react successfully on both the skin and cornea.

Some remarks on the vaccination of poultry against pox and diphtheria with antidiphtherin, L. de Blieck and T. van Heelsbergen (*Vet. Rec., 7 (1927), No. 27, pp. 571–573*).—The authors consider their experiments to have proved that when the chickens are in the first stage of the incubation period during the vaccination, the diphtheria is favorably affected by the antidiphtherin, the disease being either cut short or progressing in a very light degree.

Since the active power of the vaccine can not be maintained when out of the ice box for any length of time, they have succeeded in drying and preserving it in powder form in a vacuum tube. In this form it will remain active for some months.

A disease of pigeons caused by a member of the Salmonella group [trans. title], J. LAHAYE and R. WILLEMS (*Ann. Méd. Vét., 72 (1927), No. 6, pp. 241–260, pl. 1*).—This is a report of studies made of an affection of the pigeon due to what is thought to be *S. aertrycke*, or a species very closely related.

Helminths collected from the domestic fowl (Gallus domesticus) and the domestic pigeon (Columba livia) in Natal, P. L. LE ROUX (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 1 (1926), pp. 207–217*).—The author finds that the domestic fowl in Natal suffers heavily from verminous infestations, including 6 species of nematodes and 9 species of cestodes which have been collected from the digestive tract. Three species of nematodes and 2 species of cestodes were collected from the digestive tract of the domestic pigeon, which may succumb to heavy infestations. Chickens may be infected with *A. sphenoides* by feeding them infested earthworms. A table is given showing the prevalence of species in 60 of the fowls examined.

The anatomy and life-history of the fowl tapeworm (Amoebotaenia sphenoides), H. O. MONNIG (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 11–12, pt. 1 (1926), pp. 197–206, figs. 6*).—The discovery of the occurrence of some 80 specimens of *A. sphenoides* and a severe enteritis in each of a number of fowls in the fall of 1924, the first to be reported in South Africa, led to the investigations here considered. Cysticercoids, of which the hooks resemble those of *A. sphenoides*, were found in earthworms collected in a fowl-run infested with this tapeworm. Earthworms representing a new variety, *Ocnerodrilus* (*Ilyogenia*) *africanus* Beddard, were artificially infected with this cysticercoid by placing them in a box of soil to which droppings of the infested fowls were added. The development of the cysticercoid was followed by means of a series of stages obtained from artificially infected earthworms. Clean chicks fed with earthworms containing the cysticercoid became infected with *A. sphenoides*, while the controls remained uninfected. It was found that the cysticercoid needs about 14 days for its complete development and the tapeworm about 4 weeks.

Efficacy of "iodine vermicide" pills for the treatment of ascarid and hookworm infestations in silver foxes, W. L. CHANDLER (*Jour. Amer. Vet. Med. Assoc., 71 (1927), No. 2, pp. 218–220*).—The experiments conducted, here reported in tabular form, show that even single pills containing 0.4 gm. of adsorbed iodine are 100 per cent efficient, except in cases where a heavy ascarid infestation occurs.

AGRICULTURAL ENGINEERING

Annual report of the agricultural engineer to Government, Bombay, Poona, for the year 1925–26, W. M. SCHUTTE (*Bombay Dept. Agr. Ann. Rpt. 1925–26, pp. 196–201*).—Investigational work is reported on the modification of agricultural implements, including plows, seed drills, and winnowers, and work on the development of pumping plants.

Irrigation in India (*India Dept. Indus. and Labor, Pub. Works Branch, Irrig. India Rev. 1924–25, pp. 37*).—The progress of irrigation in the various provinces of India during the year 1924–25 is presented in detail.

Irrigation by flooding in the Big Bend section of Washington, A. B. CRANE (*Wash. State Col. Ext. Bul. [146] (1927), pp. 11, figs. 5*).—Practical

information on the conservation of spring floods and their subsequent distribution through the growing season in the Big Bend district is presented. It has been found that such conservation can be made on limited areas by dikes. A combined waste gate and spillway with flash-board control has been found to be a safe means of controlling the flood and holding the supply.

Surface water supply of the United States, 1923, Parts 6, 10 (*U. S. Geol. Survey, Water-Supply Papers 566 (1927), pp. VIII+395, fig. 1; 570, pp. V+183, fig. 1*).—These papers present the results of measurements of flow made on streams in the following basins during the year ended September 30, 1923: Parts 6, Missouri River basin (in cooperation with the States of Montana, Wyoming, Colorado, Iowa, Kansas, and Missouri); and 10, the Great Basin (in cooperation with the States of Utah, Nevada, California, Oregon, Idaho, and Wyoming).

Drainage and improvement of white land and similar wet land, W. L. Powers (*Oregon Sta. Circ. 83 (1927), pp. 16, figs. 12*).—This is a revision of Circular 47 (E. S. R., 49, p. 588).

Factors influencing soil moisture regulation.—I, Soil moisture forms, absorption, and retention, R. W. Trullinger (*Agr. Engin., 8 (1927), No. 6, pp. 135–139, fig 1*).—In the first contribution to the subject from the U. S. D. A. Office of Experiment Stations, an attempt is made to throw some light on the available knowledge relating to the forms in which water is present in soils and to the factors influencing its absorption and retention.

The likelihood is indicated that moisture does exist in soils in different forms with reference to its activity and availability to plants. Apparently the occurrence of these forms of moisture is governed in some instances and influenced in most by the texture and structure of soils, by their physicochemical composition, and by certain external factors such as temperature. The most striking and definite indication from this analytical summary is that the factors determining the existence of soil moisture forms also influence the absorption and retention of moisture by soils. It is pointed out, however, that the state of the available knowledge of these pheuomena seems yet so incomplete and disconnected as to leave considerable doubt as to the exact nature and extent of the influences of the factors involved. A bibliography of 45 references is appended.

New sand test, C. M. Chapman (*Concrete [Chicago], Cement Mill Ed., 31 (1927), No. 3, p. 16, figs. 2*).—A new rapid field method is described and illustrated for determining the moisture, voids, and specific gravity of sand for use in concrete.

New fire test is successful (*Concrete [Chicago], Cement Mill Ed., 31 (1927), No. 3, pp. 17–19, figs. 3*).—In a contribution from Columbia University a concrete block fire test of more than usual severity is described. In a test of stock blocks in two walls, each 14 ft. long, 9 ft. high, and 8 in. thick, the highest average temperature attained on the outside of a solid block wall after 3 hours was 141° F., and in the case of a hollow block wall 169°. The maximum inward deflection of the hollow wall at the center was 1.54 in. at the end of 3 hours, and after the fire was extinguished the wall recovered until the deflection was only 0.88 in. The maximum deflection in the solid wall at the center was 1.24 in., and the subsequent recovery after the fire was extinguished was to 0.96 in.

The chemical action of alkali on hydraulic cements, G. W. Burke (*Iowa Engin. Expt. Sta. Bul. 74 (1925), pp. 55, figs. 14*).—Studies are reported which showed that solutions of the magnesium salts react quickly and quite completely with nearly all the lime content of hydrated Portland cement. Mag-

nesium sulfate solution forms chemically equivalent amounts of calcium sulfate and an insoluble compound of magnesium, greatly increasing the volume and weight of the cement. With solutions of sodium salts the reactions proceed slowly as compared with similar salts of magnesium. The reactions of the alkali salts with lime were found to be very similar to those of cement.

The solutions that react on cement to increase its weight and volume were found to destroy concrete samples rapidly, those bringing about the greatest changes in this respect causing failure the quickest. Solutions that decreased the relative weight and volume of cement showed little or no tendency to destroy concrete samples. Magnesium sulfate solutions were found to have the greatest destructive action on concrete, followed by sodium sulfate. Magnesium chloride solutions were found to destroy concrete very slowly, although practically all the lime of cement reacts with them.

The carbonation of the lime liberated by hydration was found to render concrete more resistant to the attack of alkali sulfates. High alumina cements when treated with magnesium sulfate were found to form calcium sulfate and to precipitate an equivalent amount of magnesia within the residue. Sodium sulfate solutions reacted with high alumina cement to form sulfoaluminate and soluble sodium aluminate equivalent to the amount of sodium hydroxide formed.

Magnesium sulfate solutions reacted on high alumina cement to a much greater extent than sodium sulfate. The high alumina cements were attacked much more slowly and to a lesser extent by the alkali sulfates than Portland cements.

Tests of the fatigue strength of cast iron, H. F. MOORE, S. W. LYON, and N. P. INGLIS (*Ill. Univ., Engin. Expt. Sta. Bul. 164* (*1927*), *pp. 50, pls.* [*9*], *figs.* [*23*]).—Studies are reported as a contribution to the knowledge of the strength of cast iron as a material of construction.

For the cast irons tested the endurance ratios varied from 0.33 to 0.46, with an average value of 0.35, and as compared with average values of 0.5 for wrought iron and steel and 0.42 for steel castings. Specimens from a large cylinder casting showed lower values for both ultimate tensile strength and for endurance limit than did specimens from castings in the shape of pipes. The endurance limit of the latter specimens was increased about 30 per cent, and that of the former about 40 per cent by the application of a large number of cycles of stress slightly below the original endurance limit. This is taken to indicate that cast iron develops some intra-crystalline slip with consequent favorable readjustment of stress distribution without starting a fatigue crack.

The effect of holes and grooves in reducing the fatigue strength of specimens from castings in the shape of pipes was found to be less than these effects in steel specimens, and much less than the effect indicated by the theoretical stress intensification at such irregularities.

Tests at elevated temperatures of specimens from castings in the shape of pipes gave little indication of reduction of either ultimate tensile strength or of fatigue strength up to 800° F., and the proportional diminution of fatigue strength under higher temperatures was found to be slightly less than the proportional diminution of ultimate tensile strength and of Brinell hardness.

Tests of the fatigue strength of these specimens under cycles of flexural stress varying from 0 to a maximum in tension showed the endurance limit to be 48 per cent above the endurance limit for cycles of completely reversed stress. Tests of the fatigue strength under cycles of axial stress varying from 0 to a maximum in compression showed the endurance limit to be 59 per cent of the ultimate (static) compressive strength.

Fuels and their combustion, R. T. Haslam and R. P. Russell (*New York and London: McGraw-Hill Book Co., 1926, pp. XVI 809, figs. 304*).—This book is the outgrowth of work at the Massachusetts Institute of Technology. It contains chapters on the fuel situation, origin and composition of coal, types of coal and their classification, spontaneous combustion and storage of coal, coal resources and coal production, petroleum, other primary fuels, the chemistry of the combustion reactions, combustion of the elementary fuels, combustion calculations, properties and combustion of gaseous fuels, combustion of coal on grates, the operation of hand-fired furnaces, mechanical stokers and furnaces, powdered coal, the combustion of fuel oil, furnace efficiency and distribution of heat losses, producer gas, water gas and oil gas, and the carbonization of coal. Appendixes are included on the flow of liquids and gases, flow of heat, and rate of heating.

A thermodynamic analysis of internal-combustion engine cycles, G. A. Goodenough and J. B. Baker (*Ill. Univ., Engin. Expt. Sta. Bul. 160 (1927), pp. 69, figs. 24*).—The object of the investigation reported was to apply an accurate system of analysis to the two leading cycles of internal-combustion engines, and to obtain thereby accurate values for ideal efficiencies under various conditions. A secondary object was a comparison of the efficiencies obtainable for various liquid fuels.

The results indicated that the efficiency increases with the compression ratio, and for the same compression with the amount of air used. The mean effective pressure, and therefore the power, is a maximum when the air supply is somewhat less than 100 per cent of the theoretical amount. Thus the mixture for maximum power is a mixture of relatively low efficiency. The ideal efficiencies obtained from the various liquid fuels are practically the same. The efficiencies of the Diesel cycle as a group range higher than the efficiencies of the Otto cycle.

It is concluded that a more complete expansion engine with throttle control should show a higher thermal efficiency and greater fuel economy than a similar engine operating on the standard Otto cycle.

The planning of poultry houses (*[Gt. Brit.] Min. Agr. and Fisheries Misc. Pub. 47 (1927), pp. 26, pls. 7, figs. 3*).—Practical information is given on the planning of poultry houses adapted to conditions in England, together with working drawings, specifications, and bills of materials.

The construction of a laying house for poultry (*North. Ireland Min. Agr. Leaflet 28, rev. (1927), pp. 8, pl. 1*).—Practical information on the planning and construction of laying houses for poultry adapted for conditions in Northern Ireland is presented, together with working drawings and bills of material.

Constructing a wooden-hoop silo, A. B. Crane and W. W. Henry (*Wash. State Col. Ext. Bul. 141 (1926), pp. 16, figs. 15*).—Practical information on the construction of a wooden-hoop silo is given.

Silos and silage, R. W. Thornton et al. (*Union So. Africa Dept. Agr. Bul. 7 (1927), pp. 46, figs. 24*).—Practical information on the planning and construction of different types of silos is presented, together with working drawings and bills of materials, and discussions on the making and feeding of silage are given.

The construction of smokehouses for small rubber estates, T. E. H. O'Brien (*Ceylon Dept. Agr. Bul. 79 (1926), pp. [1]+7, pls. 4*).—The general principles of smokehouse design for rubber curing are presented, and working drawings for typical structures are given.

The primary purpose of smoke curing of rubber is to dry the sheets, and efficient ventilation should be provided in order to carry away the moisture

as quickly as possible. Each wet sheet placed in a smokehouse contains approximately 0.5 lb. of water, which requires at least 65 cu. ft. of dry air at a temperature of 115° F. for its removal. In a smokehouse containing 3,000 sheets, a minimum flow of air of 20,000 cu. ft. per day is required if the sheets are to be dried in 10 days. There should be ventilation both at the top and bottom of the smokehouse, and either the top or bottom ventilators should be capable of adjustment. The object should be to obtain a uniform draft throughout the smokehouse.

Since another object of smoking is to render the sheet resistant to mold, it was found by experiment that sheet smoked with uncombusted smoke is more resistant to mold than sheet smoked with combusted smoke. In general an open fire at floor levels tends to give combusted smoke, whereas a fire in a deep hole in the floor gives a higher proportion of uncombusted smoke.

House and home, G. Gray (*Philadelphia and London: J. B. Lippincott Co., 1927, 2. ed., rev., pp. XI+356, pl. 1, figs. 189*).—This is intended to be a manual and textbook of practical house planning. It contains chapters on the home and the house; the location; plans; house planning; materials and construction; plumbing; heating; lighting; built-in conveniences and labor savers; exterior design—ancient and medieval architecture; exterior design—modern architecture; interior design; the grounds; the business of building; alterations; the farm house; multiple houses and the housing problem; the standard house; reducing the cost of shelter; town planning; owning v. renting; and suggestions to teachers. A bibliography is included.

Your house, J. R. McMahon (*New York: Minton, Balch & Co., 1927, pp. IX+307, pls. 4, figs. 21*).—This is a very popular treatise on the financing, planning, building, remodeling, and upkeep of a home.

RURAL ECONOMICS AND SOCIOLOGY

[Rural economics investigations at the Ohio Station] (*Ohio Sta. Bimo. Bul., 12 (1927), No. 5, pp. 164–168*).—Investigations are reported as follows:

Variations in yield of hogs slaughtered at Federal inspected packing plants, G. F. Henning.—A table is given showing by months from January, 1923, to April, 1927, the percentages of yield of hogs slaughtered at Federal inspected packing plants. The causes of the variations are briefly discussed.

Number and size of farms in Ohio, J. I. Falconer.—A table is given showing the number of Ohio farms of different sizes in 1900, 1910, 1920, and 1925, and the percentages of decrease in size from 1910 to 1925.

Index numbers of production, wages, and prices, J. I. Falconer.—The usual data in this series are reported in tabular form.

Land legislation and settlement in New Zealand, W. R. Jourdain (*Wellington: New Zeal. Dept. Lands and Survey, 1925, pp. 248, pls. 6*).—Summaries are given of the legislation by the Imperial Government, Governor's ordinances, and the General Assembly of New Zealand, 1840–1876, disposing of Crown (or waste) lands of the State; of the legislation of the provincial councils, 1858–1876, administering the waste lands of the Crown; and of the land legislation by the General Assembly of New Zealand, 1877–1924. Brief references are made to public reserves, but the laws relating to native lands or freehold lands are not included. Histories of land settlement in New Zealand and of the Lands and Survey Department and a list of officials who have been connected with the administration of lands are included.

The course of rural land values in Canterbury, N. Z., 1914–1925, J. B. Condliffe and H. R. Rodwell (*Econ. Rec., 3 (1927), No. 4, pp. 35–51, figs. 5*).—

Tables and graphs with explanatory text are included showing and comparing the index numbers by years from 1914 to 1925 of land values, wholesale prices of farm produce, value of production, farm costs, value of total production of farm produce, and rate of profit and bankruptcy rate among farmers. Land values in Canterbury and in the United States are also compared.

Some phases of taxation in Pennsylvania (*Penn. Dept. Agr. Bul. 437 (1926), pp. 82*).—The results of two studies are included in this bulletin as follows:

Part I. *Rural taxation in Pennsylvania*, F. P. Weaver (pp. 5–43).—Data are presented showing for farm and borough or city property in Lebanon, Lancaster, Westmoreland, Crawford, Wyoming, and Warren Counties the ratio of assessments to sales values, the degree of accuracy with which assessments measured selling prices, the influence of size of property upon the ratio of assessment to the value of property, the taxes paid, and the ratio of taxes to income. The data show that the ratios of assessments to value of both urban and rural properties vary greatly, that those on farm property are generally higher than on town property, and that in some counties those for large properties are lower than for small properties. The total taxes on farm property in the State in 1925 were found to be about 38.37 per cent of the total earnings from such property, which was at least 13 per cent greater than the percentage of the average earnings of the State, including agriculture, which went for taxes. In the counties in the southeastern part of the State, town real estate owners paid 16.5 and farmers 17.5 per cent of their net incomes for taxes. In the northern and western counties the percentages were 24.5 and 55, respectively. The causes of the unequal assessments and tax burdens are discussed.

Part II. *Wealth, income, and State taxes paid by various groups of businesses in the State*, C. L. King (pp. 45–82).—The results are given of a study of the wealth, incomes, and State taxes of the various industrial groups of the State.

Tenth annual report of the Federal Farm Loan Board for the calendar year 1926, A. W. Mellon et al. (*U. S. Treas. Dept., Fed. Farm Loan Bd. Ann. Rpt., 10 (1926), pp. III+57*).—This report to Congress covers the operations of the Federal land banks, joint stock land banks, Federal intermediate credit banks, and national farm loan associations for the year ended December 31, 1926. Numerous tables and statistical reports are included.

Bounties on agricultural products: A selected bibliography, compiled by A. M. Hannay (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 20 (1927), pp. [4]+128*).—This is a selected bibliography in mimeographed form covering the States of the United States and foreign countries. It is limited as far as possible to direct bounties, subsidies, and premiums, except in the case of the indirect sugar bounties granted by European countries during the eighteenth century, and the import certificate system.

Economic status of the grape industry, S. W. Shear and H. F. Gould (*California Sta. Bul. 429 (1927), pp. 126, figs. 30*).—This bulletin gives the results of a study of the grape industry made in cooperation with the California Development Association. The chief available statistical data regarding the industry in California and other sections of the United States are analyzed, with a view to determining the economic situation of and the outlook for the California fresh grape industry. The economic situation of the raisin industry is also discussed briefly.

It is pointed out that since 1921 the price and purchasing power of both table and wine grapes have declined precipitously, the purchasing power of

table varieties in 1925 and 1926 being below the pre-war level. It is deemed probable that the purchasing power of table varieties will remain at this low level for the next few years, while that of wine grape varieties will fall below the 1926 level, due to the increase in production.

A statistical study of creamery operation, E. S. Guthrie (*Jour. Dairy Sci., 10 (1927), No. 3, pp. 250–260*).—This article is based upon data obtained from 78 Minnesota creameries for the year 1919. The factors studied were the price of butterfat in cents, the price received for butter in cents, score of butter, percentage overrun, cost of labor, hours of labor per 1,000 lbs. of butter, production of butter, building cost per 1,000 lbs., and equipment cost per 1,000 lbs. of butter. Tables are given showing the mean, standard deviation, and coefficient of variability for each factor, and the coefficient of correlation between each factor and every other factor. The multiple correlation between the first factor above and the second, third, and sixth factors was 0.82. The amount of labor, volume of output, and quality were found to be the important considerations in butter making.

Crops and Markets, [August, 1927] (*U. S. Dept. Agr., Crops and Markets, 4 (1927), No. 8, pp. 281–328, figs. 2*).—The usual tables, charts, reports, summaries, etc., are given for cotton and other crops, dairy and poultry products, livestock and livestock products, feedstuffs, fruits and vegetables, prices, etc. Special reports are included on the cattle, sheep, and wool outlooks, the cotton and lamb crops, and index numbers of the value of farm real estate, 1912–1927.

Report on markets and fairs in England and Wales.—Part 1, General review (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 13 (1927), pp. 80, pls. 22, figs. 4*).—This number of the series previously noted (E. S. R., 56, p. 387) is an introductory or general report on markets and market conditions in England and Wales. Included are a general description of the origin, development, regulation, and administration of markets, and market charges and finance, and more detailed descriptions of the retail, wholesale, livestock, abattoirs, cold stores, and hide and skin markets.

[Cooperation in India], D. Clouston (*India [Dept. Agr.] Rev. Agr. Oper., 1925–26, pp. 83–88*).—Data are given regarding the membership and work of agricultural societies in the several provinces, the cooperative cotton sale and milk societies, and cattle insurance societies.

[The Bengal Wholesale Cooperative Society, Limited] (*Bengal Coop. Jour., 13 (1927), No. 1, pp. 17–24*).—The plan of organization and operation of this society, formed for the purpose of federating all of the agricultural sale and supply societies of Bengal, is described.

Washington agriculture, Parts 7–10 (*Wash. State Col. Ext. Bul. 134, pts. 7 (1926), pp. 15; 8, pp. 94, figs. 74; 9, pp. 97, figs. 67; 10 (1927), pp. 19*).—These are part of the series previously noted (E. S. R., 56, p. 786), part 7 having appeared in mimeographed form. Part 8, by O. M. Morris and M. D. Armstrong, includes data on apples, and part 9, by the same authors, data on pears, peaches, prunes, cherries, and apricots, submitted for the Economic Conference on Horticulture, held at Yakima, Wash., on January 25 and 26, 1927. The data for each fruit cover the general situation and status of the industry, the factors of production determining the future, the cultural practices and problems, and marketing. Part 10 contains the recommendations and resolutions passed by the Economic Conference.

English farming, past and present, Lord Ernle (*London and New York: Longmans, Green & Co., 1927, 4. ed., pp. XVI+506*).—This is the fourth edition of the work previously noted (E. S. R., 38, p. 192). The appendixes on the agricultural population, wages, wheat prices, and the statistics of cropping and

livestock have been brought up to date. A new chapter on the war and State control, 1914–1918, was added in the third edition (1922), and one on peacetime farming, 1919–1927, is added in the present edition.

Farm income and farm life (*New York: Amer. Country Life Assoc., 1927, pp. XI+324*).—This is the symposium on the relation of the social and economic factors in rural progress previously referred to (E. S. R., 57, p. 402). It was prepared by D. Sanderson, J. H. Kolb, and M. L. Wilson, representing the American Country Life Association, and A. Boss, F. D. Farrell, and O. G. Lloyd, representing the American Farm Economic Association, and contains the following chapters:

The measure of rural progress, by W. M. Jardine, L. H. Bailey, K. L. Butterfield, and R. A. Pearson; the fundamental values of farm life, by E. Davenport, E. R. Eastman, and L. L. Bernard; the goal of economic efficiency in agriculture, by E. G. Nourse and J. D. Black; the farmer's standard of living, by M. C. Burritt, E. Davenport, W. J. Spillman, and C. C. Taylor; living standards and farm incomes, by H. C. Taylor; the competition of lower standards of living, by A. E. Cance, M. Ezekiel, and E. G. Mears; the relation of agriculture to commerce and industry, by W. M. Jardine and C. C. Davis; economic efficiency in agriculture and social welfare, by B. H. Hibbard and H. A. Wallace; the relation of economic status to the standard of life, by E. L. Kirkpatrick, E. Mumford, and C. C. Taylor; How do the economic limitations of the poorer agricultural sections affect social conditions? by R. T. Ely, O. F. Hall, J. A. Ferrell, and C. E. Allred; relation of types of farming to expenditure and culture, by W. J. Spillman, G. A. Pond, C. E. Lively, and E. L. Kirkpatrick; the social effects of tenancy, by W. B. Bizzell, B. H. Hibbard, and O. M. Johnson; the social aspect of the cooperative movement, by C. W. Holman and E. G. Nourse; the economic aspect of rural health, by W. F. Draper; the economic aspect of rural education, by G. A. Works; the economic aspect of sociability, by W. Burr and N. T. Frame; the economic value of the beautiful in rural life, by F. A. Waugh; and the effect of social welfare on economic efficiency and rural progress, by A. E. Cance, P. L. Vogt, C. J. Galpin, and E. deS. Brunner.

Included also are introductions and summaries of the several chapters by members of the committee, and a chapter of conclusions, together with an outline by the committee for a cooperative study of the relation of social and economic factors in rural progress.

Attitudes and problems of farm youth, E. L. Kirkpatrick (*U. S. Dept. Agr., Ext. Serv. Circ. 46 (1927), pp. 51*).—This is a mimeographed report of a study made in cooperation with the Bureau of Agricultural Economics. It is based upon replies to a questionnaire received from 6,460 boys and girls living on farms, and 1,420 living in villages or towns. Of the total, 5,608 were obtained by the extension forces of the Department and different States, and of this number about 75 per cent were 4-H club members. About 600 of the questionnaires were obtained by the rural communities department of the National Board of the Young Women's Christian Association, approximately 650 by the Federal Board for Vocational Education, and about 1,000 by the rural division of the U. S. Bureau of Education, the Cooperative Education Association of Virginia, the department of rural sociology of the Colorado Agricultural College, and the department of rural life of the University of Missouri. In presenting the data, the status or conditions, the surroundings, and the activities of the boys and girls are described; their attitudes as to the farm or village as a place to live, their choice of occupation, intention of continuing in school and kind of college to be attended, and the reasons for their like or dislike of farm or village life are analyzed; and the data interpreted with

special reference to the influence of extension work on the attitudes of farm youth toward farming and farm life.

The following inferences or conclusions are drawn from the study: (1) Farm youth like the farm, and village youth the village as a place to live. The work or vocational aspect appears to be one of the chief reasons given by the farm boys for like or dislike, and the health and nature aspects the reasons most often stated by farm girls for like of farm life. (2) Farm boys generally are inclined toward farm life, and both farm and village girls toward teaching. (3) School status, home conveniences, participation in local group activities, and whether parents are owners or tenants have little bearing on the attitudes of the youth. (4) Prevailing attitudes are closely associated with personal contacts of adult workers in agricultural extension. (5) Youths of the ages and schooling of those included in the study recognize few, if any, of the specific problems pertinent to youth. The problems of farm youth exist primarily in the minds of adult workers, and program building must be based primarily on the knowledge and experience of such workers. (6) Extended study of the attitudes of older farm youths is needed to ascertain at what periods of development and under what circumstances, if at all, farm boys and girls become imbued with dislikes for farming and farm life.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The early days of the Agricultural Education Association, T. H. Middleton (*Agr. Prog. [Agr. Ed. Assoc., London], 3 (1926), pp. 47–60*).—A brief history of the Agricultural Education Association of Great Britain.

[Agricultural education in India, 1925–26], D. Clouston (*India [Dept. Agr.] Rev. Agr. Oper., 1925–26, pp. 69–82*).—The work in the agricultural colleges and agricultural schools, the short courses in agricultural subjects, and the extension work carried on during 1925–26 are described.

Teaching agricultural vocations, R. M. Stewart and A. K. Getman (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, pp. VII+377, figs. 9*).—This volume is designed for teachers and prospective teachers of agricultural vocations in schools and departments of secondary grade. The purposes and functions of vocational education in agriculture, the guidance of pupils in the selection of vocational curricula, the type of organization to accomplish the aims of agricultural education, the construction of the curriculum and the course, teaching methods, measurement of the progress of pupils, and the promotion of professional growth of the teacher are considered.

Making the most of agriculture, T. Macklin, W. E. Grimes, and J. H. Kolb (*Boston and London: Ginn & Co., 1927, pp. VIII+542, figs. 183*).—This is a textbook of rural economics and rural sociology for high schools and short-course classes. Besides an introductory chapter, there are 12 chapters on efficient marketing, covering the farmer's market, the marketing system, the methods and agencies of marketing, the services of assembling, grading, packaging, processing, transporting, storing, financing, distributing, risk spreading, and selling, the price problem, and cooperative marketing and organization for that purpose; 12 chapters on profitable farming, covering farming as a business, factors influencing profits, size of business, diversification and specialization, efficiency in production, crops and livestock in the farm business, farm layout, labor, power, machinery, buildings, records, and accounts, and the farm lease; and 12 chapters on worth-while living on the farm, covering the farm family and its home, the country neighborhood, the farmer's town and service station, the town and country service community, community

institutions for communication, education, religion, sociability, and social welfare, and community organization.

Each chapter is supplemented by selected readings, exercises, and topics for discussion.

Productive plant husbandry, K. C. DAVIS (*Philadelphia and London: J. B. Lippincott Co., 1927, 4, ed., enl., pp. XVI+LVa+462, pl. 1, figs. 312*).—A revised edition of the text previously noted (E. S. R., 54, p. 589).

FOODS—HUMAN NUTRITION

Bacterial flora of the market oyster, C. ELIOT (*Amer. Jour. Hyg., 6 (1926), No. 6, pp. 755–776*).—This is the report of an extensive study of the bacteriology of oyster spoilage under controlled conditions of temperature and time. The oysters were for the most part purchased in the shell at Baltimore markets and oysterhouses and were stored as shell stock or shucked under aseptic conditions in the laboratory.

Both shucked and shell oysters kept at laboratory temperature showed a sudden and maximum rise in total count from the second to the fourth day of storage. In oysters stored in a cool basement the count of *Bacillus coli* increased from 4 to 500,000 in 14 days, but as signs of spoilage appeared the count of *B. coli* decreased.

Oysters spoiling in the shell showed little change in H-ion concentration, but shucked oysters became markedly acid during the first few days of spoilage, after which the original pH was regained and maintained. Oysters kept in the ice box showed a maximum total bacterial count of only about one-tenth that at room temperature, and the rise in acidity was slower and not so marked.

The bacteria found in decomposing oysters could be divided into five principal groups: The colon-aerogenes group; the streptococci; the "water bacteria," including members of the green fluorescent; the yellow-pigmented and the nonpigmented groups, and vibrios; the anaerobes; and the incidental organisms, such as the chromogenic cocci and the aerobic spore-formers. Either the colon-aerogenes or the streptococcus group was responsible for initiating the souring process, depending upon the proportion originally present. After a varying period of time, 12 days or longer, the water forms multiplied rapidly and actual decomposition of the oysters began. Members of the green-pigmented and yellow-pigmented groups produced changes in sterilized oysters comparable to those observed in decomposing market oysters, including a slimy chromogenic growth and a marked softening and sometimes liquefaction of the oyster meat. Several types of anaerobes multiplied in the decomposing oysters, with the production of large amounts of gas, but apparently with no putrefactive changes.

A number of references to the literature are appended.

Preparing and cooking beef, J. A. CLINE and R. S. GODFREY (*Missouri Sta. Circ. 159 (1927), pp. 4*).—This circular contains directions for preparing and cooking tender and tough cuts of beef, including broiled steak, planked steak, rib roast, pot roast, Swiss steak, mock duck, and meat birds. The directions for rib roast differ from the customary method in that a preliminary searing at high temperature is not followed, but the meat is roasted at a fairly low temperature, 320° F., until done, 17 minutes per pound being allowed for a medium-done roast.

Some factors influencing the experimental baking test, R. S. HERMAN and V. M. HART (*Cereal Chem., 4 (1927), No. 3, pp. 157–183, figs. 30*).—The importance of the standardization of baking tests for determining the quality of

flour is shown by the results reported in baking tests on one kind of flour with one factor altered at a time. The different factors studied, all of which were found to produce differences in varying degree in the finished loaf, were size and shape of fermenting jars and baking pans, type of water, punching schedule, severity of punching, different mixing time and speed, placement of dough crease, use of varying amounts of nondiastatic and high-diastatic malt extracts, powdered milk, mineral salts, shortening, cane sugar, Cerelose, yeast, salt, and pan greasing, the degree of freshness of the yeast, the type of yeast, the fermentation period, the proofing period, and oven temperatures.

The nutritive value of wheat, paddy, and certain other food-grains, R. McCarrison (*Indian Jour. Med. Research, 14 (1927), No. 3, pp. 631–639, pl. 1, fig. 1*).—In this comparison of the nutritive value of wheat, whole rice (paddy), and cambu and cholam, two other food grains occasionally used in India, groups of 6 young rats each were fed ad libitum a basal diet of meat residue 20, purified starch 60, olive oil 8, salt mixture (McCollum) 5 parts, and water. One group received the basal diet alone and the others the same diet supplemented by 2 per cent cod-liver oil, 5 per cent dried yeast, 2 per cent cod-liver oil and 5 per cent dried yeast, 2 per cent of cod-liver oil and 5 per cent marmite, and 1 gm. of the four grains, respectively.

The growth curves showed growth for a short period followed by loss in weight on the basal diet alone, growth for a slightly longer period followed by decline on the basal diet supplemented by cod-liver oil only, and growth at increasing rates on the basal diet supplemented by rice, yeast, cod-liver oil and yeast, cholam, cambu, cod-liver oil and marmite, and wheat. The different effects of the various grains on growth are considered to be due chiefly to differences in the vitamin A and B content, but in part to differences in the content of mineral salts, chiefly manganese. Growth on the basal diet supplemented only with yeast is thought to indicate the presence of some vitamin A in the olive oil (Lucca) of the basal diet.

Analyses, both proximate and mineral, of the four grains are included. The manganese content of the wheat was nearly four times that of the rice.

The digestibility of potatoes as influenced by methods of preparation, B. Boggess and A. C. Ivy (*Jour. Home Econ., 19 (1927), No. 9, pp. 496–503*).—The relative digestibility of the starch of French fried, pan fried, and boiled potatoes was determined in vitro by artificial digestion experiments with pancreatin and pancreatic juice, with determinations of the reducing sugar by the Munsen-Walker method, and in vivo by observations of the emptying time from the stomach in two dogs, four men, and one woman.

In the in vitro experiments it was found that the starch of the pan fried potatoes was more easily digested than that of the boiled or French fried potatoes. The added fat in the amount used appeared to facilitate the rate of digestion. In dogs boiled potatoes were emptied from the stomach at a faster rate than fried potatoes, there being no appreciable difference in the rate of pan fried and French fried. In four of the five human subjects the emptying times were practically the same for all of the potatoes, while in the fifth subject the emptying time for boiled potatoes was shorter than for pan fried potatoes. Fat added to the boiled potatoes caused quite a marked delay in emptying time.

It is concluded that "the gastric motor mechanism of some individuals is more susceptible to the inhibitory action of fats than others. In susceptible individuals a digestive disturbance, when it occurs, is more probably due to disturbed gastric motility than to alleged decrease in the digestibility of the potato due to the presence of fat. In the average normal individual fried

potatoes, unless steeped in fat, are no more likely to cause digestive disturbances than boiled potatoes."

The effect of the use of salt in cooking vegetables, F. R. LANMAN and E. S. MINTON (*Ohio Sta. Bul. 406 (1927), pp. 17*).—This is the complete report, with experimental data, of the study previously noted from a summarized report (E. S. R., 57, p. 192).

The home preservation of fruit and vegetables, M. J. M. WATSON (*London: Humphrey Milford, 1926, pp. VII+142, pls. 12, figs. 12*).—An English manual on canning and preserving fruits and vegetables.

Canning, preserving, and jelly making, J. McK. HILL (*Boston: Little, Brown & Co., 1927, rev. ed., pp. IX+197, pls. 8*).—Many interesting new recipes for preserves, jellies and pickles have been included in the revision of this volume, the first edition of which was published in 1915.

The behavior of the anthocyan pigments in canning, C. W. CULPEPPER and J. S. CALDWELL (*Jour. Agr. Research [U. S.], 35 (1927), No. 2, pp. 107–132*).—This investigation of the relation of anthocyan pigments to the violet, pink, and purple discoloration often developing in fruits and vegetables canned in tin had its origin in an attempt to explain the discoloration in peaches canned by home canning clubs in Georgia in 1924.

Preliminary tests of aqueous extracts of the pigments of peach stones and skins with granular tin or stannous chloride suggested that the color change was probably due to an interaction between the anthocyan of the peach and the tin. This was confirmed in tests with the isolated and partially purified anthocyan of peaches. The behavior of a large number of anthocyan-containing fruits and a few vegetables was then studied by means of canning tests in plain and enameled tin and in glass, as well as by tests of aqueous solutions of the pigments with tin and aluminum salts. With everything except beets changes similar to those observed with peaches took place in the presence of tin or aluminum, indicating that the formation of violet colored salts with tin or with salts of tin or aluminum is a general property of the red anthocyan pigments. The anthocyan of beets differs from other anthocyan pigments in that it contains nitrogen to the extent of 8.6 per cent, which may account for the fact that instead of changing to a purple color there was a partial loss of color. The amount of violet compound formed in most cases appeared to be determined by the amount of pigment present and the degree of acidity of the medium, low acidity favoring its formation. The color changes were reversible, addition of acid tending to restore the original color.

The relation of anthocyan pigments to corrosion and perforation was studied in experimental packs of the anthocyan-containing fruits and others containing no pigments in plain and enameled tin cans with and without exhaust. A comparison of the exhausted and unexhausted cans 6 to 9 months after canning showed that the presence of oxygen and anthocyan pigment hastened corrosion, while the presence of high acidity retarded corrosion in the pigmented fruits. Perforation was greatest in the enameled cans of highly pigmented products, although the original color was preserved better in the enameled than in the plain tins. The explanation of this is that the enamel reduces discoloration by decreasing the contact between pigment and metal, but at the same time increases the rapidity with which perforation of the metal occurs by limiting the area from which the metal can be removed.

The complexity of the factors involved in corrosion is summarized as follows: "The principal factors concerned in corrosion are oxygen, acidity, anthocyan, and tannin. Some of these factors stand in antagonistic rela-

tionship. High acidity generally favors corrosion, but depresses the formation of metal-anthocyan compounds and may thus retard corrosion. High acidity represses oxidation of tannin and formation of hydrous stannous oxide. Oxygen accelerates corrosion and increases the total activity by oxidizing the ferrous and stannous salts to the corresponding ferric and stannic states. The interrelationships of the factors concerned are so complex that practically every substance canned presents a specific problem."

Blending apple juice to improve its quality, J. S. Caldwell (*Fruit Prod. Jour. and Amer. Vinegar Indus., 6 (1927), No. 12, pp. 12–14*).—This is a reprint of the portion of U. S. D. A. Farmers' Bulletin 1264 (E. S. R., 47, p. 508) dealing with the classification of apples according to the characteristic quality of their juices and the proper blending of apples from the different groups for cider of the best quality.

Grape juice and its preparation, R. O. Brooks (*Fruit Prod. Jour. and Amer. Vinegar Indus., 6 (1927), No. 12, pp. 15–18*).—This paper includes directions for the manufacture of grape juice reprinted from U. S. D. A. Bulletin 656 (E. S. R., 39, p. 208), together with a compilation of data on the composition of the fresh juice of Concord, Catawba, Clinton, Delaware, Ives, and Norton grapes.

Sugar-tolerant yeasts in chocolate-coated creams, M. B. Church, H. S. Paine, and J. Hamilton (*Indus. and Engin. Chem., 19 (1927), No. 3, pp. 353–357, figs. 3*).—This report of an investigation at the Bureau of Chemistry, U. S. D. A., of the cause of the "bursting" of chocolate-coated cream center candy includes a discussion of what constitutes a commercial cream or fondant, a review of the literature of previous investigations on the subject, and the detailed report of preliminary studies from which the conclusion was drawn that the chief cause of the explosions is the presence in the fondant of yeasts of high sugar tolerance which are able to grow and form gas in the candy. It is thought that the trouble can be reduced by proper sanitary conditions in the factory, the use of sound ingredients, and the use of a cream of high sirup density.

Means for preventing "explosive" or bursting fermentation of chocolate-coated fondant candy, H. S. Paine, V. Birckner, and J. Hamilton (*Indus. and Engin. Chem. 19 (1927), No. 3, pp. 358–363, figs. 6*).—In connection with the investigation noted above, an attempt was made to solve the problem of the bursting of fondant candies through increasing the density of the sirup used in the fondant by the use of invertase, as previously recommended by Paine (E. S. R., 51, p. 808).

It was found that by adding a suitable proportion of invertase to the fondant before the centers are molded the density and osmotic pressure of the sirup phase could be increased sufficiently to render it resistant to fermentation. The critical solids content above which fermentation is prevented was found to be 79 per cent. Fondants containing imbedded fruits offered special difficulties owing to the decrease in density of the sirup about the fruit as the result of diffusion of the fruit juice. In such cases a combination of preliminary heating of the fruit and the use of a liberal proportion of invertase was found to prevent the fermentation satisfactorily.

The protein values of foods in nutrition, H. H. Mitchell (*Jour. Home Econ., 19 (1927), No. 3, pp. 122–131*).—A general discussion based largely upon the author's studies on the biological value of proteins (E. S. R., 57, p. 593).

Copper as an industrial contaminant in foodstuffs, C. G. King and G. Etzel (*Indus. and Engin. Chem., 19 (1927), No. 9, pp. 1004, 1005*).—Copper determinations by the xanthate method are reported for three types of foods commonly prepared in copper or brass equipment, including four groups of acid

fruit products representing different trade practices, milk from nine different plants, and carbonated beverages from two plants. Care was taken to prevent the introduction of any traces of copper during the analyses.

The same materials manufactured in different plants showed wide variations in copper content. These appeared to be correlated chiefly with the care and type of equipment employed. The products from one of the plants contained copper in amounts such that 100 gm. daily would furnish more copper than the limit of safety suggested by Mallory (E. S. R., 55, p. 492). Milk pasteurized by the electropure method had a lower content of copper than that pasteurized by the usual methods, but none contained more than 1 part per million. Raw milk filtered through copper screens that had been exposed to the air between batches contained 0.97 part, and milk condensed in copper vacuum pans 3.7 parts per million. Carbonated beverages prepared in the cold in brass equipment had less than 1 part of copper per million.

Magnesium content of normal rats at different ages, G. Medes and G. J. Humphrey (*Jour. Biol. Chem., 74 (1927), No. 1, pp. 149–151*).—Supplementing a previous study of magnesium metabolism in the rat (E. S. R., 55, p. 894), the authors have determined the calcium, phosphorus, and magnesium content of rats of both sexes at 30, 60, 90, and 120 days and of female rats at 150 days of age, from 2 to 6 rats being used for each sex and age.

The absolute amount of magnesium increased with age until 90 days and then remained approximately constant. It was greater at any given age in the male than in the female of the same weight. Pregnancy resulted in a loss in body weight, accompanied by a decrease in the absolute amount of calcium and phosphorus, but no change in the absolute amount of magnesium.

The effect of manganese on growth, R. McCarrison (*Indian Jour. Med. Research, 14 (1927), No. 3, pp. 641–648, figs. 2*).—In an effort to determine whether the better growth on wheat than on rice in the study noted on page 889 was due to its higher content of manganese, the effect of added manganese on growth was tested in two series of experiments on young rats. In the first, manganese dioxide to the extent of 0.889 mg. daily, representing a concentration of 1 part of manganese to 12,600 parts of the food eaten, retarded growth to an increasing extent after 32 days' consumption of the compound. In the second series, manganese chloride was substituted for the manganese dioxide to the extent of 0.0327 mg. daily, or 1 part of manganese in 617,700 parts of the food. This appeared to have a stimulating effect on growth.

"The conclusion appears to be justified that concentrations of manganese of the former order are harmful to the animal organism, while concentrations of the latter order are beneficial. And since a diet containing a fair proportion of whole wheat provides a concentration of manganese of the latter order, it may be concluded that the growth-promoting properties of whole wheat are in part due to the content of manganese in this cereal."

Toxicity of zinc, V. G. Heller and A. D. Burke (*Jour. Biol. Chem., 74 (1927), No. 1, pp. 85–93*).—In this more detailed account of an investigation which has been noted from a progress report (E. S. R., 57, p. 596), data are given on the growth and the zinc content of various organs of rats fed different amounts of zinc and on the elimination of zinc by way of the urine and feces.

As noted previously, the consumption of zinc in amounts as great as would ever be found in contaminated foods had no effect on growth, reproduction, and the normal functions of rats. The internal organs of the zinc-fed rats were only slightly higher in their content of zinc than the controls and were entirely normal in appearance. The total ash content of the organs showed no perceptible increase. The excretion of zinc was found to take place chiefly through the

feces, although the content in the urine was slightly increased in the zinc-fed animals.

The production, collection, and distribution of human milk, B. R. Hoobler (*Jour. Amer. Med. Assoc., 88 (1927), No. 23, pp. 1786–1789*).—This account of the organization and work of the Detroit Bureau of Wet Nurses is of particular interest in connection with the series of papers by Macy et al. (E. S. R., 57, p. 390), since the human milk used in the studies there reported was obtained from the bureau. During the past 10 years the bureau has handled 668,347 oz. of milk. Conforming to the customs for cow's milk, two grades are distributed—pasteurized, representing pooled milk which may be expressed at home or at the bureau, and "certified," which must be expressed at the bureau and contain not more than 10,000 bacteria per cubic centimeter. The cost of production is from 14 to 18 cts. an ounce and the selling price from 30 cts. an ounce to nothing. About half of the output is sold at cost or below.

Preparation of lactic acid milk mixtures for infant feeding, McK. Marriott (*Jour. Amer. Med. Assoc., 89 (1927), No. 11, pp. 862, 863*).—A simple and convenient method of preparing lactic acid milk (E. S. R., 50, p. 856) from evaporated milk and lactic acid is described. The method, originally devised for use while traveling, has proved so successful that it is recommended for routine use throughout the year, but most particularly for warm weather or whenever the milk supply is at all questionable.

Some observations on the feeding of young children, M. E. Sweeny (*Jour. Home Econ., 19 (1927), No. 6, pp. 307–312*).—This discussion of the most important principles in training children to like a variety of foods is based upon the experience of the author at the Merrill-Palmer nursery school. Color, flavor, and consistence of the food; variety in menus, with attention to the fact that children of different ages prefer different food combinations; and participation in the preparation and serving of the meals are among the factors discussed.

The vital capacity of the negro child, F. L. Roberts and J. A. Crabtree (*Jour. Amer. Med. Assoc., 88 (1927), No. 25, pp. 1950–1952, figs. 4*).—Determinations of the vital capacity of 1,564 white children and 1,254 negro children from rural and urban districts in Tennessee are reported, with the following conclusions, based upon a statistical treatment of the data obtained:

The negro children had vital capacities lower than white children of the same age, of the same body weight, and of the same standing height, but practically the same vital capacities as white children of the same stem length. The differences were in all cases greater for the boys than for the girls.

The constitutional and nutritive states of the Japanese and the "Miyagawa index," F. Matsuoka and N. Ishii (*Japan Med. World, 7 (1927), No. 5, pp. 130–133*).—This report includes data on weight, height, sitting height, and chest girth of Japanese boys and girls of from 5 to 20 years of age, including over 12,000 subjects from four different localities—an agricultural district, a seaside village, an urban district, and a factory section.

A good diet and a bad one: An experimental contrast, R. McCarrison (*Indian Jour. Med. Research, 14 (1927), No. 3, pp. 649–654, pls. 3, fig. 1*).—The extremes of good and bad diets were fed ad libitum for six months to two groups of 20 young rats each. The good diet contained an abundant supply of whole wheat, milk and dairy products, and green leafy vegetables, and the poor diet bread made from white flour, vegetables cooked in water containing soda and salt, canned meat preserved with formaldehyde, a butter substitute containing boric acid, and tea. At the end of the experiment, 17 out of the

20 animals receiving the good diet were alive, while only 11 of the other group were alive and all were in poor nutritive condition. Of the 9 deaths in the second group, 6 were attributed to broncho-pneumonia. Differences in the condition of the intestines and in fertility and body weight were also marked.

Studies of the vitamin potency of cod liver oils, XIV, XVI, XVII, XX (*Boston Med. and Surg. Jour., 194 (1926), No. 12, pp. 537, 538, fig 1; 192 (1925), No. 7, pp. 300–302, fig. 1; 193 (1925), No. 16, pp. 726–728, fig. 1; 195 (1926), No. 6, pp. 263–265, figs. 5*).—The four papers noted below form a part of the series of studies on the vitamin potency of cod-liver oils previously noted (E. S. R., 53, p. 864).

XIV. *The variation in daily food consumption of experimental animals*, A. D. Holmes and M. G. Pigott.—The advantage of administering the material to be tested for its vitamin content apart from, instead of mixed with, the basal ration is shown in curves representing the average daily food consumption of 215 white rats for the 60 days of the pre-experimental and experimental periods required in the authors' technique for determining vitamin A in cod-liver oils, together with the variations in the amount of cod-liver oil which would have been consumed had it been incorporated in the basal diet to the extent of 1 per cent in place of being fed separately. The amount of oil varied from 48 mg. daily at the beginning of the experimental period to 70 mg. daily at the height of food consumption toward the end of the period.

XVI. *The vitamin A potency of shad body oil*, A. D. Holmes.—Analytical constants of shad body oil are reported as follows: Sp. gr. at 25° C. 0.9203, refractive index at 30° 1.4702, saponification value 188.3, iodine number 134.4, and acid value 0.5336. The oil was found to be low in its content of vitamin A, amounts of 0.7 to 29.8 mg. per day proving valueless in curative tests.

XVII. *The vitamin potency of salmon body oil*, A. D. Holmes and M. G. Pigott.—Data similar to the above are reported for salmon body oil. The analytical constants were sp. gr. at 25° 0.9196, refractive index at 20° 1.475, saponification value 187.7, iodine number 142.2, and free fatty acids 0.7717 per cent. Amounts of from 0.3 to 11.6 mg. daily had no curative value in the vitamin A experiments.

XX. *Effect of light on the vitamin A content of cod-liver oil*, A. D. Holmes and M. G. Pigott.—Tests of the vitamin A value of samples of cod-liver oil from the same source but kept for 16 months under varying conditions of exposure to light and sunshine indicated a destruction of vitamin A with increasing exposure to light. All of the light reaching the oil passed through at least two thicknesses of glass. "It is evident that during the storage and distribution of cod-liver oil, it should be packed in light-proof containers, such as amber bottles or flint bottles wrapped in paper or cartons."

The vitamin A content of skim milk [trans. title], J. B. Platon (*Biochem. Ztschr., 185 (1927), No. 4–6, pp. 238–241, figs. 2*).—In an effort to determine the distribution of vitamin A in milk, a group of young rats was fed as the sole source of vitamin A whole milk with a fat content of 2.8 per cent, and another group skim milk obtained with a hand separator from another sample of the same milk and having a fat content of 0.18 per cent. The whole milk was given in amounts varying from 1.75 to 2.8 gm. daily and the skim milk was fed ad libitum.

The minimum amount of the whole milk producing any growth lay between 1.75 and 2 gm. daily. The largest amount of skim milk consumed daily was 20 gm., but this proved entirely insufficient for growth. Reasoning that if all of the vitamin A is contained in the fat of the milk an amount of 28 cm. of the skim milk daily would be required for growth to the same extent as that on

the whole milk, the author concludes that if the vitamin A is contained in any other constituent of milk than the fat it must be in insignificant amounts.

The association of vitamin A with greenness in plant tissue.—I, The relative vitamin A content of head and leaf lettuce, M. DYE, O. C. MEDLOCK, and J. W. CRIST (*Jour. Biol. Chem., 74 (1927), No. 1, pp. 95–106, figs. 6*).—In this comparative study of the vitamin A content of green and white lettuce, groups of rats were placed at weaning on a basal diet of irradiated cornstarch 78, purified casein 18, and the McCollum salt mixture 4 per cent, with 0.5 gm. daily of dried Fleischmann yeast, and were given as the sole source of vitamin A 0.3 gm. in the first series and 0.2 gm. in a later series of experiments of fresh lettuce daily. In the first experiment, 12 animals received the yellowish inside leaves of head lettuce, 13 leaf lettuce, and 8 no source of vitamin A. After 8 weeks, the feeding of the lettuce was reversed, those formerly receiving head lettuce now receiving the leaf and vice versa.

Composite curves of growth showed very clearly the superiority of the leaf lettuce over the head lettuce. In the second experiment a slowing up of gain in the animals changed from leaf to head lettuce and a rapid increase in the other group brought the two groups to practically the same level at the end of the second 8 weeks. A comparison of the inner and outer leaves of the same heads of market lettuce showed the outer leaves to be considerably richer in vitamin A than the inner leaves. Leaf lettuce grown in the hothouse and out of doors showed no appreciable difference in vitamin A content.

Discussing these results, the authors conclude that "though no certain identity of chlorophyll or any of its primary phases with vitamin A in lettuce tissue has been proved, the evidence points plainly towards the probability of some close relationship between the two."

A quantitative study of the determination of vitamin B, H. C. SHERMAN and E. H. MACARTHUR (*Jour. Biol. Chem., 74 (1927), No. 1, pp. 107–115, figs. 4*).—The factors involved in attempts to determine vitamin B quantitatively by the rat-growth method are discussed on the basis of a large amount of experimental work. The technique employed, based upon that of Sherman and Spohn (E. S. R., 51, p. 368), is described, and data are first presented on the growth of four groups of 10 rats each receiving 3, 4, 5, and 6 cc. of uniform evaporated milk six days a week. The amount selected as most satisfactory for the purpose of the experiment was 5 cc., since on this amount there were no deaths, but growth was so restricted that the results of the experiment were not complicated by other constituents or physical properties of the milk. The growth curve on this amount showed a distinct gain in weight for 2 or 3 weeks, followed by a slight decline for a similar period and then by a considerable period of approximately constant weight.

Other points brought out with supporting evidence are that a period of 8 weeks is more satisfactory than 6, that there is no advantage in a preliminary depletion period, and that starting at the same age larger animals make smaller gains and males slightly larger gains than females on the same allowance.

Vitamin B determination and requirement with special reference to protein intake, H. C. SHERMAN and O. H. M. GLOY (*Jour. Biol. Chem., 74 (1927), No. 1, pp. 117–122, figs. 2*).—The view advanced by various workers, particularly Hartwell (E. S. R., 55, p. 694), that there is a quantitative relationship between protein and vitamin B requirement has been tested by systematically varying the amount of protein in the standard basal ration described in the above paper by Sherman and MacArthur, and also by varying the amount of vitamin B in the form of orange juice.

In the 8-week period usually employed, no differences could be noted as the result of varying the protein from 12 to 54 per cent of the ration, in the survival period on deprivation of the vitamin, or in the weight curves on a restricted allowance of the vitamin. The authors conclude that there is no basis for any belief that the vitamin B requirement is influenced by the protein intake, at least in the age period covered by these experiments.

"The results amply justify the conclusion that basal diets may vary widely in protein content and still yield interchangeable results in the testing of foods for vitamin B, and also that with a basal diet containing 18 to 20 per cent of protein the protein intake may be much changed by the feeding of either a high protein or a low protein food as a source of vitamin B without affecting the validity and quantitative value of the test as an indication of the relative vitamin B content of the food tested."

The detection of the antirachitic factor in grass grown in the dark and behind window glass [trans. title], W. Völtz and W. Kirsch (*Biochem. Ztschr., 186 (1927), No. 1–4, pp. 255–263, figs. 3*).—The authors present evidence from curative experiments with rats on the McCollum rickets-producing diet that grass seeds contain no demonstrable amounts of antirachitic vitamin, but that etiolated seedlings grown in the dark from the same seed and grass grown in the sunlight behind window glass have curative properties. Phosphorus and calcium analyses of the materials fed indicated that the curative action could not be attributed to a more favorable proportion of calcium and phosphorus. On the basis of these observations, the statement of Windaus (E. S. R., 57, p. 197) and others that the antirachitic factor can be synthesized only through irradiation of the provitamin ergosterol is questioned.

A note on the vitamin D content of the stomach oil of the Australasian petrel (Aestralata lessoni), J. L. Leigh-Clare (*Biochem. Jour., 21 (1927), No. 3, pp. 725–727*).—The stomach oil of the Australasian petrel, *A. lessoni*, has been shown by the methods of Chick, Korenchevsky, and Roscoe (E. S. R., 56, p. 89) to have a vitamin D value equal to about one-fifth that of cod-liver oil. "How the vitamin D came into the stomach oil is unknown. This oil appears to consist mostly of cetyl esters and therefore not to be the undigested fatty residue from the 'whale feed.' However, the fact that the mutton bird feeds on the same crustacean (whale feed) as the Australian red cod. seems to suggest that this might be the common source from which both bird and fish draw their supplies of vitamin D."

Dietary requirements for reproduction, V–XI, B. Sure (*Jour. Biol. Chem. 69 (1926), No. 1, pp. 29–74, pl. 1, figs. 3; 74 (1927), No. 1, pp. 37–84, fig 1*).—The seven papers noted below continue the series of studies previously noted (E. S. R., 53, p. 565).

V. *The rôle of various vegetable and fruit oils in fertility and lactation* (pp. 29–40).—The value of various fruit and vegetable oils as sources of vitamin E was determined by incorporating the oils in place of a corresponding amount, generally 5 per cent, of dextrin in a basal sterility-producing diet consisting of skim milk powder 50, ferric citrate 0.2, agar 2, Harris yeast vitamin 0.4 to 1, cod-liver oil 2, and dextrin 44.8 to 45.4 per cent. Litters containing more than six were reduced to that number, and the feeding was continued until weaning at 25 or 26 days or until the young had died.

Of the various oils tested, wheat, cottonseed, corn, and palm oils were the only ones permitting fertility and normal lactation. Of these wheat oil was the most potent. Peach kernel, soy bean, peanut, and olive oils in amounts constituting 5 per cent of the ration were effectual in curing sterility but nonpotent for lactation. Linseed, coconut, sesame, palm kernel, rapeseed, mustard,

sweet almond, and commercial corn oil (Mazola) did not prevent sterility when fed at 5 per cent concentration.

VI. *Types of sterility produced on a skimmed milk powder reproduction-deficient diet* (pp. 41–51).—This has been essentially noted from another source (E. S. R., 56, p. 363).

VII. *The existence of a lactation-promoting factor in the unsaponifiable matter from wheat oil* (pp. 53–74).—Evidence presented in this paper not only confirms the work of Evans and Burr (E. S. R., 54, p. 561) on the occurrence of the antisterility factor in the nonsitosterol fraction of the nonsaponifiable material from wheat oil, its stability toward heat and oxidation, and the capacity possessed by female rats for storage of this factor, but also suggests the possibility that what has hitherto been considered one factor, vitamin E, is made up of two, the thermostable antisterility factor and a thermolabile factor possessing lactation-promoting properties. The second factor is thought to be less stable than the first to oxidation, as well as to heat, and to be stored in the female to only a limited extent. Various methods of preparing concentrations of the unsaponifiable matter of wheat oil are described.

It is announced in conclusion that since the completion of the experimental work reported in this group of papers a synthetic diet composed of purified food substances has been prepared on which five litters of young have been weaned, although at an abnormal rate.

VIII. *Further studies of a skimmed milk powder reproduction-deficient diet* (pp. 37–44).—Repeating the work of Anderegg and Nelson (noted below), the author was unable to confirm their findings. Further work on the effects of aerated oil has shown that the oxidized oil is apparently toxic to the organism, and has led the author to state that a differentiation of a lactation-promoting vitamin from vitamin E, as suggested in the preceding paper, can not be made unless more convincing evidence is obtained.

A method is described for the preparation of unsaponifiable extracts of crude cottonseed oil capable of preventing female sterility when fed to the extent of 0.0175 per cent of the skim milk powder reproduction deficient diet. Larger amounts, 0.035 per cent of the ration, of the unsaponifiable matter added to the same diet are followed by beneficial effects on lactation.

IX. *Cod liver oil versus wheat oil as sources of vitamin E* (pp. 45–53).—In this study, in which the author had the technical assistance of H. M. Boggs, the deficiency of cod-liver oil in vitamin E was demonstrated with three different types of vitamin E-deficient diets, the skim milk diet previously described, a synthetic diet containing large amounts of defatted wheat embryo as a source of vitamin B, and a highly purified synthetic diet containing 5 per cent of Harris yeast as a source of vitamin B. The cod-liver oil used was abundant in known fat-soluble vitamins other than E.

X. *Vitamin B requirements for normal lactation* (pp. 55–69).—Evidence is presented showing that considerably larger amounts of alcoholic extracts of wheat embryo as the source of vitamin B are required for lactation than for growth. A cold 75 per cent ethyl alcohol extract of 6.5 gm. of whole wheat embryo per rat per day furnished enough vitamin B for excellent growth, while for normal lactation the extract from at least 22.4 gm. of wheat germ was required. The 75 per cent alcoholic extract was not as rich in vitamin B as the 25 per cent extract.

XI. *The potency of butter fat in vitamin E* (pp. 71–84).—In this report of a study extending over a period of 2 years on the value of butterfat as a source of vitamin E, emphasis is placed on the necessity of adopting continuous fertility as a criterion for the potency of the antisterility factor. It

was found that to secure continuous fertility and successful lactation on butterfat as the sole source of vitamin E an amount equivalent to at least 10 per cent of the ration was required. Even with this amount the results were not as good as with only 1 per cent of wheat oil as the source of vitamin E.

Milk powders as food.—II, Observations on the existence of vitamin E, L. T. ANDEREGG and V. E. NELSON (*Indus. and Engin. Chem., 18 (1926), No. 6, pp. 620–622*).—Continuing the study previously noted (E. S. R., 53, p. 866), the authors present evidence which, in their opinion, indicates that failure of reproduction in the skim milk diet previously used may be due to decomposition of the cod-liver oil when mixed with the other highly desiccated constituents of the diet. By administering cod-liver oil separately and adding water to the diet, fourth generation young have been secured. These results are thought to render the existence of vitamin E doubtful.

The malnourished child: An individual, intensive method of treatment, L. W. SAUER (*Jour. Amer. Med. Assoc., 89 (1927), No. 12, pp. 931–934, fig. 1*).—A brief outline is given of the method which has been successfully used by the author for several years in the treatment of malnourished children. The method is based upon a properly adjusted five-meal diet rich in vitamins, ample bed rest, and restricted daily routine. Tables are given of 100-calorie portions of the various foods used in the diet and of the special treatment and results in gain in weight for three successive months of 30 consecutive cases. The average gains were 5 lbs. for the first month, 3.5 for the second month, and 2.9 lbs. for the third month.

Prevention of anorexia in children, C. A. ALDRICH (*Jour. Amer. Med. Assoc., 89 (1927), No. 12, pp. 928–931*).—In the author's method of treating anorexia, or failure of appetite, in young children much depends upon the education of the parents in child psychology. Among the suggestions made are reducing rather than forcing the food at the first appearance of anorexia, avoidance of overfeeding and of prescribing definite amounts of food after the first year, changing the character of the food gradually rather than abruptly, allowing some choice between foods of equivalent value, and leaving the child to himself as much as possible during meals.

A liver cocktail: Liver in edible form for the pernicious anemia patient, W. T. WILKINS, JR. (*Jour. Amer. Med. Assoc., 89 (1927), No. 12, p. 967*).—A recipe is given for raw liver cocktail, which, if carefully prepared according to the directions, is said to be "acceptable and even enjoyable to pernicious anemia epicures."

Cereals and rickets, H. STEENBOCK, A. BLACK, and B. H. THOMAS (*Indus. and Engin. Chem., 19 (1927), No. 8, pp. 906, 907*).—The contention of Mellanby (E. S. R., 52, p. 367) that oatmeal is especially rickets-producing through containing a toxic factor reacting with fat-soluble vitamins has been tested on several hundreds of rats and 83 dogs, with results indicating that oatmeal was somewhat less rickets-producing than corn in the dog and rat experiments and somewhat more so than wheat in the rat experiments.

"In any case the defect of the cereals can be remedied by the judicious supplemental use of foods high in calcium—and also high in phosphorus in special instances—and by the treatment of the cereal with ultra-violet radiations. By the latter means vitamin D can be produced in abundance so that even without mineral additions a rachitic condition can be much improved. Knowledge of these facts makes it possible to use cereal grains and their products for human and animal nutrition to the greatest advantage."

Rickets: A brief summary, with reflections, H. J. GERSTENBERGER (*Jour. Amer. Med. Assoc., 89 (1927), No. 4, pp. 261–263*).—In this brief summary of present knowledge concerning rickets and its prevention and cure, the author

emphasizes the importance of early preventive measures. In his opinion the administration of cod-liver oil or the exposure of the child to actinic rays should be started not later than the beginning of the second week of life.

TEXTILES AND CLOTHING

The iron content of raw cotton [trans. title], P. KRAIS (*Leipzig. Monatschr. Textil Indus., 42 (1927), No. 1, p. 34*).—Damage encountered in bleaching of cotton yarn led to studies of the iron content of 63 sorts from many sources. The white fiber showed an average of 0.007 per cent of iron, yellow locks 0.083, and seed coats 0.152 per cent.

The effect of organic acids on cotton at 105–110° C. [trans. title], E. RISTENPART and K. PETZOLD (*Leipzig. Monatschr. Textil Indus., 42 (1927), No. 8, pp. 389, 390, figs. 3*).—Cotton treated with 1 per cent acetic, formic, or lactic acid could be dried at temperatures up to 110° without substantial damage. Tartaric acid should evidently be avoided in the final washing. Its prejudicial effect sets in especially after evaporation of the water and with consequent concentration of the acid. While initial damage is caused by the rapid evaporation in drying the cotton at 100° and over, further heating results in recovery such that the cotton is no longer exposed to attacks of the acid. Acid-treated cotton persistently retained traces of acid after drying. Mercerized cotton seemed in general to be resistant to acids.

Action of perspiration on textiles, F. H. DAMON (*Amer. Dyestuff Rptr., 16 (1927), No. 13, p. 508, fig. 1*).—Preliminary trials showing that common salt was the most destructive ingredient of perspiration led the author to evolve the test outlined for fastness to and tendering by perspiration.

Effect of laundering upon the thermal insulating value of cotton blankets, P. RUDNICK (*U. S. Dept. Com., Bur. Standards Technol. Paper 347 (1927), pp. 451–457, pl. 1, fig 1*).—The effect of repeated laundering upon the value of cotton blankets was studied, using sample materials representative of the most common blanket types and a laundering process corresponding to good commercial practice.

Washing was found to cause small losses in thermal resistance, but these were almost completely restored by the subsequent process which raised the nap on the laundered fabric. The net losses in thermal resistance after four applications of washing and renapping processes were negligible. The results pointed to the importance of a process for restoring the nap after washing. Shrinkage resulted in thickening the blanket, with a corresponding gain in thermal resistance.

Year book of the National Association of Cotton Manufacturers, 1927 (*Boston: Natl. Assoc. Cotton Manfrs., 1927. pp. 331, figs. 19*).—This manual is similar in scope to that of 1926 (E. S. R., 55, p. 696).

The identification of the various types of artificial silk or rayon, A. K. JOHNSON (*Lowell [Mass.] Textile School Bul., 29 (1926), No. 4, pp. 10–12*).—Simple tests for the identification of the types of rayons are outlined.

MISCELLANEOUS

Agricultural problems in Montana: Thirty-third Annual Report of the Agricultural Experiment Station, [1926], F. B. LINFIELD (*Montana Sta. Rpt. 1926, pp. 29, figs. 2*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1926, and a report of the director on the work of the station. Meteorological observations are noted on page 807.

The service of the State experiment farms, W. L. QUAYLE (*Wyoming Sta. State Farms Bul. 7 (1927), pp. 75, figs. 32*).—This is a revision of Bulletin 5 (E. S. R., 53, p. 195).

NOTES

Purdue University and Station.—An addition to the poultry building, 55 by 75 ft. and two stories in height, has been completed, providing a judging pavilion and three laboratories for instruction work.

I. C. Hoffman, assistant in vegetable gardening, has resigned to accept a position as assistant horticulturist at the Ohio Station. Hazel M. Landin has been appointed assistant professor of home management.

Minnesota University and Station.—Frederick L. Washburn, associated with the entomological and zoological work of the institution from 1902 until his retirement in 1926, died October 16, aged 67 years. Professor Washburn was born in Brookline, Mass., April 12, 1860, graduating from Harvard University in 1882 and receiving the M. A. degree in 1895. After a year as instructor in zoology in the University of Michigan he became professor of zoology and entomology in the Oregon College in 1888, later serving also as State biologist and entomologist of the Oregon Station until 1895. During the next 7 years he was professor of biology in the University of Oregon. His service in Minnesota included 16 years as professor of entomology and State entomologist and the final 8 years as professor of economic vertebrate zoology.

Professor Washburn was one of the pioneer station entomologists, organizing the work in Oregon and contributing many of its early publications, as well as a treatise entitled Injurious Insects and Useful Birds (1918). He was president of the American Association of Economic Entomologists in 1911.

Cornell University and Station.—A memorial to the late Louis Agassiz Fuertes, lecturer in ornithology, is being planned. This is to be a bird sanctuary at the head of Cayuga Lake. As a part of the development, the old Cascadilla boathouse will be transformed into a museum or nature study center.

The department of vegetable gardening is offering a new course on the grading and packing of vegetables. This course will stress production factors affecting market ability, and supplements a course in the department of agricultural economics.

Courses in clothing costs and merchandise selection have been arranged to begin in 1928–29.

Dr. C. E. Ladd, director of extension, has been given charge of the short courses offered by the College of Agriculture. One of the new courses for the present season is that of farm mechanics.

Frederick G. Behrends, extension professor of rural engineering, has resigned to become director of Hope Farm, a community and school for children at Verbank. Dr. Otto Rahn, formerly head of the dairy physics department in the agricultural experiment station at Kiel, Germany, has been appointed professor of bacteriology. C. H. Guise, assistant professor of forest management, has been appointed forest manager of the Arnot Forest given to the university last spring.

Oregon College and Station.—New greenhouses providing over 21,000 sq. ft. under glass in four ranges are under construction. The station is to have the use of about 3,300 sq. ft. of this space, and the remainder will be divided between the departments of vegetable gardening, farm crops, soils, horticulture, and botany.

The foundation is being laid for a monumental memorial union building to be dedicated to the students, alumni, and faculty members of the college who fell in the World War. Over $500,000 has already been raised in subscriptions for the building fund.

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